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Mixtec Purpura Dyeing:
A Human Ecological Perspective

by

Roslyn Feniak Madrid ©

A thesis submitted to the Faculty of Graduate Studies and Research in partial fulfillment of the requirements for the degree of Master of Science.

IN

CLOTHING & TEXTILES
Department of Human Ecology

Edmonton, Alberta

Fall 1994

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UNIVERSITY OF ALBERTA

FACULTY OF GRADUATE STUDIES AND RESEARCH

The undersigned certify that they have read, and recommend to the Faculty of Graduate Studies for acceptance, a thesis entitled **Mixtec Purpura Dyeing: A Human Ecological Perspective** submitted by **Roslyn Feniak Madrid** in partial fulfillment of the requirements for the degree of **Master of Science** in Clothing and Textiles.

J. Oakes

M. Cox-Bishop

G. Forth

Dedicated to my family,
particularly my parents and my daughter,
with gratitude.

ABSTRACT

For millennia, the purple, blue, and red dyes derived from Muricid gastropods were prized by people of the Old and New Worlds. Shellfish dyeing, using the snail *Purpura patula pansa*, continues on the Pacific coast of Mexico. Mixtec men from the town of Pinotepa de Don Luis, Oaxaca, go to the coast to dye cotton yarn. Women of the town weave the yarn into textiles, particularly *posahuancos*, skirts characteristic of traditional womens' attire of the area. Although dyeing is dangerous work, and some dyers have drowned, applying their traditional knowledge of tides and weather reduces the risk. Long-term common-property resource management, evident in the coordinated, sequential use of dyeing areas by small groups of dyers, ensured that "The Tragedy of the Commons" did not occur. Traditional methods of 'milking' the dye from the snail permitted sustained resource use. In the 1980s, unrestrained exploitation of *Purpura* by a foreign company resulted in the catastrophic reduction of *Purpura* populations. Mexican protective legislation of 1988 was intended to ensure aboriginal use of the resource. Ethnographic fieldwork in 1993, on the Mexican Pacific coast, especially in Pinotepa de Don Luis, indicates that protective legislation and the continued restrained use of *Purpura* in traditional ways have not been sufficient to restore *Purpura* populations. Extensive development for tourism of the previously uninhabited prime dyeing areas has exacerbated the situation. The critical factor is apparently the consumption of *Purpura* as food by resort workers. Without some control over access to the resource and its habitat, aboriginal rights to the use of *Purpura* are meaningless.

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INTRODUCTION

Colour is a powerful element of the language of clothing: "When somebody approaches from a distance the first thing we see is the hue of his clothes" (Lurie, 1981, p. 182). In many cultures since prehistoric times, the most precious dye of all was 'royal' purple, a dye derived from marine snails.

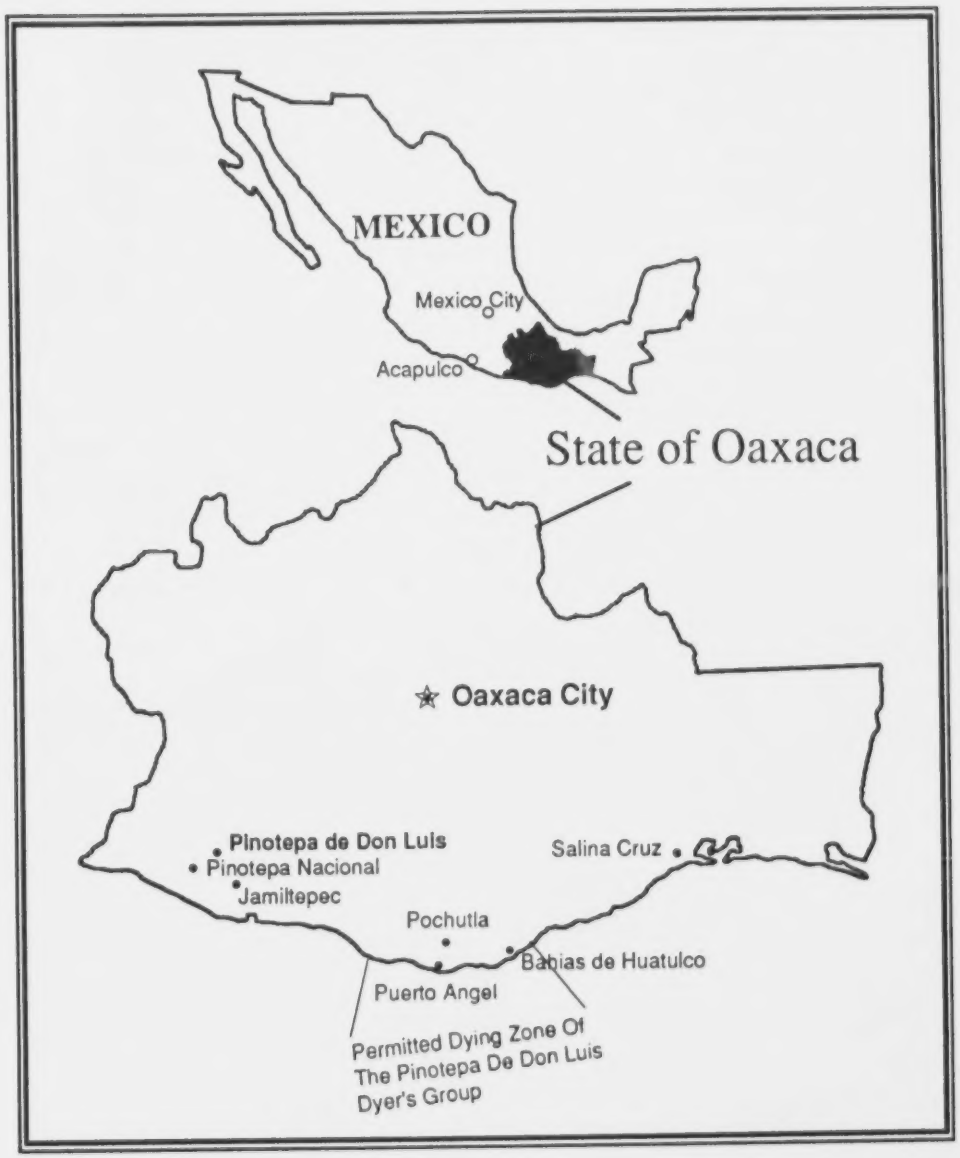
> It is the Royal purple which gave everlasting fame to the city of Tyre, became a typical characteristic of the Phoenician culture, and - ironically - left as the only lasting monuments of their settlements in the Mediterranean basin their dumps of purple shells. Here we see the refuse of man's first large scale chemical industry, and the waste of his first mass-production. (Bruin, 1967, p. 295)

All that remains of Tyrian purple, the dye which Pliny described as "esteemed beyond all others", are a few degraded fragments. The last person who might have worn *techeleth*, the 'thread of blue' which God commanded that His People wear (Rubens, 1973) so that they might remember His Law, died about 750 CE (Kaplan, 1984, p. 89). Notwithstanding considerable effort to reconstruct the processes by which these precious dyes were used, that knowledge is forgotten.

Possibly, the only place where shellfish dyeing continues to be practised is the Pacific coast of Mexico (Gerhard, 1962, 1964; Turok et al., 1988). Following the ways of their Mixtec ancestors, men bring skeins of spun cotton from Pinotepa de Don Luis, a small Mexican town about 50 km inland, to a dyeing area on the southern Pacific coast some 220 km away. (See Map 1.) There they find the *Purpura* snail, from which they coax a defensive secretion, which they dab directly onto the yarn, dyeing it a colourfast purple. Garments constructed from shellfish-dyed purple thread (Mixtec: *tixinda*) are important expressions of prestige and power among the indigenous peoples of Mesoamerica (Carlson & Wenger, 1991).

The Mexican artisans do not need to dye: one can survive without beauty, and nearly-indistinguishable natural and synthetic dye substitutes are readily available (Saltzman, 1992, p. 479). Like Rabbi Gershon, one of the great scholars of nineteenth-century Europe, who spared no cost in his search for *techeleth*, Mexican dyers risk death on wave-swept, rocky cliffs, seeking an intangible good, a connection with the Divine (Turok et al., 1988).

Purpura-dyeing areas were threatened by petrochemical pollution (Sayer 1985: 138), and commercial exploitation of the snail by Japanese business interests threatened the survival of Mexican shellfish-dyeing. As a result, in 1984, members of the Artisans' Committee of Pinotepa de Don Luis approached the General Directorate of Popular Culture to express concern about the near-extinction of *Purpura* in traditional dyeing areas. An interdisciplinary study of the effects of traditional and non-traditional harvesting techniques on the marine ecology of *Purpura*



Map 1. The State of Oaxaca.

was presented in museum exhibits (Osuna Paredes, 1989) and a book, *El Caracol Púrpura: Una Tradición Milenaria en Oaxaca* (Turok et al., 1988). The response of the Mexican government was to establish an Intersecretarial Accord – the intent of which is to ensure that *Purpura* resources are used by members of indigenous communities, in traditional ways and for traditional purposes – the use of *Purpura* (see Appendix A).

Purpose of Study

The purpose of this study is to examine *Purpura* dyeing from a human ecological point of view. There is a need to investigate social, economic, political and ideological aspects of *Purpura* dye resource management, as practised by the Mixtec dyers of Oaxaca. This will result in better understanding of the effectiveness of the management system in ensuring sustainable resource use.

Objectives

1. To identify the nature and extent of changes which took place in the management of *Purpura* populations and their habitat since the 1988 Intersecretarial Accord;

2. To determine why changes in the use of *Purpura* occurred;

3. To identify the effects of changing resource management strategies on *Purpura* populations; and

4. To consider the implications for the Mixtec of changes in *Purpura* usage.

Rationale

The ethnographic study of *Purpura* dyeing is important for several reasons. Shellfish dyeing appears to be a clear example of "knowledge as technology" (Young, 1985): successful dyeing operations depend far more on understanding aspects of the environment than on using specialized equipment or materials. Unlike such activities as flint knapping or weaving, it is difficult to deduce dyeing processes solely by investigating the artifacts produced (Reynolds, 1987; Reynolds & Stott, 1987). An ethnographic study of dyeing and related processes is the best way to understand such an activity (Spradley, 1980; Touliatos & Compton, 1988). Little research into shellfish dyeing has been conducted to date. The Pacific coast of Mexico may be the only location in the world where shellfish dyeing is still taking place.

Limitations

The focus of this study is on the human ecological perspective of dyeing and related processes from the point of view of the Mixtec artisans of Pinotepa de Don Luis. A definitive study from biological, economic,

legal, and bureaucratic perspectives was beyond the scope of the proposed research.

On the basis of earlier fieldwork in Hispanic localities, I developed sufficient language and cultural skills to conduct fieldwork in Spanish; however, I speak almost no Mixtec, which is the dominant Indian language of Pinotepa de Don Luis. This did not significantly restrict communication with individual members of the indigenous community because nearly all the Mixtec-speakers I met also spoke Spanish, and because the services of a translator were readily available. If I understood Mixtec, my understanding of artisans' meetings, which took place in Mixtec, and during which I wanted to be relatively unobtrusive, would have been enhanced significantly.

Limited amount of time available for fieldwork, linguistic limitations, and cultural expectations regarding modesty in mixed company limited the depth of information collected on the broader aspects of the Mixtec world view.

LITERATURE REVIEW

The review of publications related to aspects of the human ecology of dye-producing shellfish begins by examining *Purpura* and similar dye-producing snails as biological entities in ecological context. Literature related to shellfish dyeing in Old and New World historical contexts is also examined. A review of the literature related to the ethnography of the Pinotepa de Don Luis and area provides an overview of the cultural context of Mixtec dyeing.

Biological Aspects of Shellfish Dyeing

Shellfish dye is obtained from secretions of the hypobranchial glands of many related genera of snails. The snails used in Old and New World shellfish-dyeing are of two widely-distributed, closely related families: the Muricidae and the Purpuridae. These are sometimes grouped together as the Muricidae. Mediterranean species used for dyeing include *Murex brandaris* and *Murex trunculus* (Exmouth, 1928, p. 26). Along the English coast, *Bracinium lupullus* and *Purpura lapillis* were once used to dye the robes of church dignitaries (Robinson, 1969, p. 25). In the New World, three of the species thus used are *Purpura patula*, *Purpura collumelaris* (Turok et al., 1988), and *Thais kiosquiformis* (Gerhard, 1964, pp. 182-183).

The principal snails used on the Pacific coast of Mexico, *Purpura patula* (Linnaeus, 1758), are intertidal snails of medium size found in the Caribbean Sea and along the Pacific Coast of the tropical Americas. "The west coast population is easily separable from the Caribbean *P. patula*, by the white in the aperture as well as by [larger] size" (Keen, 1958, p. 377). These snails are assigned by Keen to *Purpura patula pansa* (Gould, 1853) and are the snails discussed in this thesis as *Purpura*.

The function of the hypobranchial secretion appears to be narcotic, and the snail may use it in both defensive and predatory ways (Garrity & Levings, 1981). The most significant natural predators of *Purpura* are crabs (grapsids), birds (cormorants and gulls), and shell-crushing fish (puffers) (Garrity & Levings, 1981). Humans also eat *Purpura*. *Purpura* may be used in traditional stuffed corn pastries (*tamales*), and it is sold to tourists as an appetizer (Turok et al., 1988). Ryesky (1977, p. 105) states that "*tixindas* (mussels)" are sold in the Sunday market in Pinotepa de Don Luis. Whether the same Mixtec term is used to indicate both *Purpura* specifically , as well as to indicate shellfish (both bivalves and gastropods) generically, is unclear. In order to indicate *Purpura* as a food source, the Mixtec word '*tixinda*' is used, even among Spanish-speakers, who may also use the more general term '*caracol*' (snail). '*Tixinda*' is also used to refer to mussels used as a food source (R. Leyva Carmona, personal communication, August 6, 1993). The collection of shellfish dye, for indigenous use and, more recently, for export to Japan, is another significant human use of *Purpura*.

It is possible that the reproductive behaviour of *Purpura* may permit the species to continue within the habitat as a whole, notwithstanding localized inappropriate use of the snail or even the destruction of some localities within the habitat. *Purpura* is planktotrophic: juveniles of the species pass through a planktonic stage, during which they are microscopic organisms, drifting in the ocean (Turok et al., 1988, p. 90). Spatfall, the process by which planktonic juveniles are deposited by currents and similar phenomena on the rocky beaches where they will spend their adult lives, may be important in creating good harvest localities (Doherty & Fowler, 1994; Roughgarden, Gaines & Possingham, 1988). Hence, population size probably is controlled regionally, and not by locality. *Purpura* has a short life cycle; maturity (30 mm size) is reached in 3 years (Turok et al., 1988, graph 1 and 2, table 5). This implies high potential for population resilience; *Purpura* populations should be able to increase rapidly and withstand high demand or frequent harvest.

History

The use of clothing for expressive and symbolic purposes is a cultural universal. Clothing may express group membership and social position, status and prestige within that group (Horn & Gurel, 1981; Kaiser, 1990; Polhemus & Procter, 1978; Roach & Eicher, 1965, 1973). "Certain special ornaments or special colours (e.g. crown, sceptre, royal purple) have always been the prerogative of royalty or of other high dignitaries" (Flugel, 1930, p. 31; Massie, 1992; Paglia, 1990, p. 141; Perkin & Everest, 1918).

Because of the high value accorded shellfish dyes, the historical literature is extensive and interdisciplinary. The most comprehensive survey (Born, 1937) is widely cited, but its usefulness is limited because it lacks bibliographic references and is not factually impeccable (cf. Bruin, 1967, p. 303; Saltzman, 1992, pp. 479-480).

Purple dye derived symbolic significance not only because of its rarity, but also from the 'womb'-like shape of the shellfish from which it was derived. In many cultures, it is magically associated with the Archetypal Feminine, fertility, the Underworld, life, death, and mourning (Gerhard, 1964 p. 28; Neumann, 1963, pp. 44-45).

> For the people of the Ancient World, and even of the Middle Ages, purple was the purest incarnation of the red colour, and red, the colour of blood, was the symbol of the sun and of fire. The conception of this most vivid of all colours was bound up with magic, with ideas of fertility, of safety from demons, and of power. He who goes in purple, wins power over men and spirits. He is raised high above the multitude. He rules. (Born, 1937, p. 115)

In an chapter devoid of bibliographic citation, Turok et al. (1988, pp. 140-141) discuss the symbolic significance of *Purpura* dye within the cultures of prehispanic Mexico. They speculate that the dye secreted by

the snail represented its blood, and that there existed a symbolic parallel between the dyeing cycle and the lunar and menstrual cycles. They relate these cycles to menstrual restrictions associated with planting, tending and harvesting crops. Furthermore, they suggest that women wear skirts containing shellfish-dyed yarn for marriage, in order to promote fertility, and for burial, to carry the essence of this life into the next.

Old World

Historical studies of Old World shellfish dyeing are relevant to the human ecology of Mixtec *Purpura* dyeing. They provide a cross-cultural understanding of the social significance accorded the scarce and valued dye. As well, Mediterranean shellfish dyeing may be examined as a case where the lack of effective resource management contributed to the demise of the practice.

Shellfish dyeing probably originated accidentally, while using the snails as a food source (Exmouth, 1928, p. 28; Gerhard, 1964, p. 28; Saltzman, 1992, pp. 477-479; Vincent, 1992). In mythology, shellfish dyeing was discovered by

> Melquart, king and deity of Tyre (the Greek Heracles, the Roman Hercules Tyrius, the father of navigation), while strolling along the shore at Tyre. When Melquart's dog bit into a 'Porphyra' shellfish its jaws became stained with purple. Melquart realized that he had discovered a dye and presented the nymph Tyros with a purple gown. (Bruin, 1967, p. 296)

The earliest available evidence of shellfish dyeing may be the purple stain inside a 13th century BCE storage jar from Sarepta, Lebanon (McGovern & Michel, 1988, p. 81). Shell-middens of dye-producing mollusks were found, often in association with evidence of Phoenician colonization, throughout the Mediterranean area, from western Turkey to the Greek and Italian mainlands, Tunisian Africa and the Balearic and Canary Islands (Bruin, 1967, pp. 297-298).

Three animal-derived dyes, red, blue, and purple, occur frequently in the Bible, usually in association with sacred or sovereign power. According to Talmudic sources, both blue and purple are shellfish-derived (Hertz, 1981, p. 326). Normally used for priestly robes and temple hangings, even a single snail-dyed thread of *techeleth* was costly and precious (Kaplan, 1984, p. 87).

The Greeks had a more secular appreciation of purple. "For the Greeks of the classical and post-classical period purple was the noblest of all colours, worthy of adorning the greatest and the most beautiful of the people. Thus statesmen, great actors and great courtesans wore purple" (Born, 1937, p. 116).

To the Romans,

> purple also represented a mark of distinction or office, as in the broad purple stripe of senators, the narrow stripe of the *equites*, and the purple-bordered *toga praetexta* of magistrates. The *praetexta* was also worn by free-born children, presumably if they could afford it. Pliny says that they wore it *pro maiestate pueritiae*, 'as a mark of the dignity of boyhood'. (Rowe, 1977, p. 47)

Julius Caesar reserved the right to wear purple robes for himself (as Triumphator); his highest officials wore the *vestae clavatae* (robes with purple stripes). Although Tiberius "discarded purple to induce the Romans to give up their passion for wearing this costly colour" and Nero "punished the wearing and even the sale of purple with death and confiscation of property", its use persisted.

> Under Alexander Severus (222-235) purple-manufacture became a monopoly of the State. The murileguli, the fishermen who provided the shell-fish were, it is true, free, but formed their own guild, with strict social laws. Their trade was hereditary. Only those who were able to buy themselves off, could take up other work. The fishermen had to supply a fixed number of shell-fish to the factories. These, as well as the fisheries, were State monopolies, and were run by State officials (procuratores baphiorum). (Born, 1937, p. 116)

The Edict issued by the emperor Diocletian in 301 CE established prices for principal articles of commerce for the Eastern empire. According to Exmouth (1928, p. 27), "the price of wool of good medium quality was set at about $1.50 a pound. The same wool, heavily dyed with this [purple] colour, was worth about $350 a pound, in gold."

The ascetic early Christian church discouraged the vanity of luxurious clothing. "[Dye] is unnecessary for health, afflicts greedy eyes, and moreover, it is false, for God would have made the sheep purple if He had wished the woolen clothes to be purple" (Commodianus, 3rd century CE, *in* Lurie, 1981, p. 182). It was not long, however, until shellfish-dyed priestly and imperial robes were being used to express sacred power in Byzantium. At the end of the fourth century, Emperor Theodosius reserved for himself the use of pure purple dyes (*blatta*, *oxyblatta*, and hyacinth purple), and threatened death for their unauthorized sale or use (Born, 1937, pp. 120-121).

Scarcity of the dye resource was not the only factor causing the decline of the purple dyeing industry in the Near East. In the seventh century, Tyre was conquered by Arabs who were governed by early Islamic law which demanded austerity in personal dress (Gerhard, 1964, p. 178). Concurrently, less costly substitutes for shellfish dye became available because of technical improvements in the use of coccus-dye derived from the insect *kermes* (Born, 1937, p. 123).

Shellfish dyeing was also practised in the Orient. "Ancient middens of *Murex* and *Purpura* were discovered in China and Japan, and purple garments were found in early Chinese burials" (Gerhard, 1964, p. 178). In tenth-century Japan, only by permission of the Emperor could courtiers wear the deep red and purple colours thus derived. The medieval Zen poet Ikkyu writes of his embarrassment at assuming leadership of a monastery after years of tilting against the establishment: "Shameful today, a purple-robed monk" (Arntzen, 1986, p. 31).

There were extraordinary efforts to reconstruct shellfish dyeing processes performed in ancient times. In 1887, Rabbi Gershon Henoch Leiner (1839-1890) used his knowledge of Jewish literature to rediscover the source of *techaleth*. He believed he had found it in the common cuttlefish (*Sepia officinalis*). By 1890, nearly fifteen thousand people were using the dye he manufactured for the production of their ritual garments. Other authorities opposed this practice, and it declined after his death that year, but some people continue to prefer this dye (Kaplan, 1984, pp. 92-95; Ziderman, 1987, pp. 26-27). Subsequent analyses show that the colouring matter thus obtained is "Prussian blue, the first modern synthetic pigment, originally prepared in Berlin in 1704 with bullock's blood" (Ziderman, 1987, p. 27).

In 1909, Paul Friedlaender isolated and purified the dye present in the secretion of *Murex brandaris* (Doumet, 1980, p. 34). The molecule, dibromoindigotin, resembles the indigo molecule, but has two additional bromine atoms. Under some circumstances, it is possible to detach the bromine atoms (Schweppe, 1988, p. 18). Turok et al. (1988, p. 81) observe that the literature does not contain an exact chemical formula for *Purpura*-derived dye. Saltzman (1992, p. 480) gives an absorption spectrum for "shellfish purple", but not the methodology by which it was derived. Like indigo, shellfish dyes are vat dyes which, compared to other natural dyes, are very resistant to fading. The snail secretes its dye-bearing exudate in a soluble, colourless, reduced state. The colour appears gradually and becomes insoluble, as oxidation occurs in the presence of air and light (Born, 1937, pp. 107-108; Robinson, 1969, pp. 23-24; Saltzman, 1992, p. 476).

Bruin (1967, p. 302) says that "dyeing wool with indigo-like dyes is a simple process and the tools of the dyer have always been primitive", but he refers to old-Egyptian recipes dating to 1400 BCE:

> At first these were thought to be recipes for imitation of the costly Royal purple, but later studies of Reinking revealed rather that they describe refined methods of achieving various shades of colour in the purple. Possibly it was such knowledge and its masterly application that formed the secret of Tyrian supremacy in purple dyeing in later centuries.

Doumet (1980) conducted experiments to replicate Roman shellfish dyeing. He based his work on a contemporary description by the Roman naturalist Pliny (1956, pp. 77-82), who described the dyeing process thus:

> Three days is the proper time for it to be steeped (as the fresher the salt the stronger it is), and it should be heated in a leaden pot, and with 50 lbs. of dye to every six gallons of water kept at a uniform and moderate temperature by a pipe brought from a furnace some way off, this will cause it gradually to deposit the portions of flesh which are bound to have adhered to the veins, and after about nine days the cauldron is strained and a fleece that has been washed clean is dipped for a trial, and the liquid is heated up until fair confidence is achieved. A ruddy colour is inferior to a blackish one. The fleece is allowed to soak for five hours and after it has been carded is dipped again, until it soaks up all the juice. The whelk by itself is not approved of, as it does not make a fast dye; it is blended in a moderate degree with sea-purple and it gives to its excessively dark hue that hard and brilliant scarlet which is in demand; when their forces are thus mingled, the one is enlivened, or deadened, as the case may be, by the other. The total amount of dyestuffs required for 1,000 lbs. of fleece is 200 lbs. of whelk and 111 lbs. of sea-purple; so is produced that remarkable amethyst colour. For Tyrian purple the wool is first soaked with sea-purple for a preliminary pale dressing, and then completely transformed with whelk dye. Its highest glory consists in the colour of congealed blood, blackish at first glance but gleaming when held up to the light; this is the origin of Homer's phrase, 'blood of purple hue'.

Doumet varied the metals used for the vessels containing the dye, the reducing agents used, the amount of solution dilution or exhaustion, and vinegar post-dyeing treatment. His experiments produced dyed wool and dye precipitates of subtle colours from delicate rose to blue-violet.

Referring to his own research into Pacific invertebrates, marine biologist Ed Ricketts said:

> It is suspected that the color sense of ancient peoples was based on standards that would seem strange to us. No doubt the colors that thrilled the ancient Romans would arouse contempt in a schoolboy artist of today, since the civilization of Tiberius knew nothing of our lacquers and brilliant coal-tar dyes. (Ricketts & Calvin, 1962, p. 190)

I, on the other hand, find it difficult to believe that the Romans might have identified any of the muted colours produced by Doumet as either a brilliant scarlet or the colour of congealed blood.

The search for authentic *techeleth* continues, making full use of twentieth-century analytical technology and with unreserved discursive energy (McGovern & Michel, 1988; Ziderman, 1987).

New World

The earliest evidence of purple shellfish dye in the New World is found as a pigment on cotton mummy wrappings dating to about the first century BCE., from the Ica Valley in Peru (Gerhard, 1962, p. 179). Textile fragments dating to about 1500 CE found in a cave in Chiapas, Mexico, have a similar painted purple band (Johnson, 1954, p. 142). Purple from an undetermined source appears on a number of Mixtec and Zapotec pre- and post-Colombian pictorial documents, in association with royal personages or territories (Gerhard, 1962, pp. 179-180; Nuttall, 1909, pp. 380-384; Parmenter, 1982, personal communication, August, 1992).

The earliest European account of shellfish dyeing in the New World seems to be a visitor's report from Nicoya, Costa Rica, in 1529, which states that the Native people were using "shells or oysters of purple" to dye "mantas, and cotton thread, and other things " (Oviedo *in* Gerhard, 1962, p. 179). Subsequent accounts describe shellfish dyeing as far north as the Mexican state of Jalisco; by Huaves, Chontales, Zapotecs and Mixtecs in Oaxaca; by Quepos, Borucas, and Guaymis just south of Nicoya; and as far south as Ecuador. The area of indigenous trade in dyed yarn included Mexico, Guatemala, Costa Rica, El Salvador, Panama, Nicaragua, Ecuador, and Peru. Dyed yarn was also sold to Spaniards in the Old and New Worlds (Gerhard, 1962, pp. 179-182).

Shellfish dyeing continued along the Pacific Coast of southern Mexico (Born, 1937; Gerhard, 1962, 1964; Nuttall, 1909; Turok et al., 1988). As long as *Purpura* was exploited only by local interests, sustained resource utilization continued, although expansion of the traditional dyeing area, possibly to compensate for reduced snail populations, was noted by Nuttall (1909, p. 370).

The earliest first-hand, observation-based documentation of the process of dyeing, as practised by people from Pinotepa de Don Luis, was that of Gerhard (1962). Gerhard's account went beyond simply a description of a technological process, since he considered reasons why the practice continued only in Mexico. He speculates that unique qualities of *Purpura patula pansa,* which may not be present in related species, make it possible to harvest the dye of *Purpura* without harming the snails (Gerhard, 1962, pp. 178-179, 182).

Pinotepa de Don Luis

The town of Pinotepa de Don Luis is located in Oaxaca, a mountainous state in southwest Mexico. (See Map 1.) The climate of Oaxaca ranges from cool temperate to tropical. Although Oaxaca's boundaries contain considerable linguistic and cultural variation, they correspond roughly to a "unit of Mesoamerican culture history" (Paddock, 1966, p. 88). In the northern and eastern part of Oaxaca, Mixtec (and, to a lesser degree, linguistically related Trique and Amusgo) are the dominant indigenous languages. Pinotepa de Don Luis is a

village situated in the lowland coastal part of Mixtec country known as the *Costa Chica* (Ravicz & Romney, 1967, pp. 367-369). Through an extensive examination of historical sources, Ryesky demonstrates that "although relatively isolated, the Costa Chica of Oaxaca has enjoyed political and economic prominence various times in its history" (Ryesky, 1977, p. 17). The construction of a jeep trail before 1964 from Pinotepa Nacional to Pinotepa de Don Luis and, in 1968, of the Pacific coastal highway have facilitated transportation for the local population and made the area much more accessible to outsiders (Gerhard, 1964; Ryesky, 1977).

According to the 1973 census, there were 3,678 inhabitants in Pinotepa de Don Luis. By 1993, according to local statistics, the population was 8,567 (see Appendix D). Of the 80% who speak Mixtec, many also speak Spanish. Some parts of the municipality have electricity, water and sewage service. There were three federally-funded primary schools, a bilingual-bicultural primary school, a high school, eighteen general stores, six cantinas, two pharmacies and three mills for grinding corn (Turok et al., 1988, p. 36).

A very high cultural value is placed on the production of corn within the local subsistence economy. Because of land reforms, 97% of the land belongs to the local *ejido*, "land held communally, but subject to division into plots held in usufruct by individuals", but two thirds of the bottom land, which can produce two crops a year, is privately owned. Because land is scarce and becoming exhausted (levels of production are among the lowest in Mexico), there is an increasing dependence on non-agricultural activities, including migratory labour and craft production (Ryesky, 1977, p. 86).

The basic social and economic units are the nuclear and extended families. Beyond the kinship network, important ritual ties are formed through god parenthood (Ravicz, 1967). Except for a small number of Pentecostals and Jehovah's Witnesses, participation in a hierarchical civil-religious 'cargo' system within the syncretistic local version of Roman Catholicism is how one offers service and acquires prestige; it also functions as a redistributory device to prevent the accumulation of wealth (Cancian, 1967).

There is a strong social stratification between the mestizo and indigenous populations. Mestizos are Spanish-speaking, more likely to be landowners or engage in commerce, and wear 'western' clothing. Native people are more likely to speak Mixtec in the home, and tend to wear traditional clothing. Attire is a significant indicator of ethnic identity, and the term "redressed" is used to describe a native person who has adopted mestizo clothing to seek greater social mobility (Ryesky, 1977, p. 71). Since 1975, there has been pressure on primary students to wear western dress, and it is required of high school students (Ryesky, 1977, p. 145).

> [Traditional] Coastal Mixtec male attire consists of loose pants which cross and tie in front (Sp. *calzon*; Mix. *chatu*). The waist length shirt (Sp. *coton*; Mix. *cota*) has a square neckline and three-quarter length sleeves. Both garments usually are made of white muslin or of a sailcloth type of fabric. Men complete their costume with sandals which have soles made from rubber tires and a hat, either straw or of black felt. They carry their possessions in a knotless net bag. (Ryesky, 1977, p. 142)
>
> Today, the [traditional] female costume in most of the area consists of the blue, purple, and red or magenta striped wrap-around skirt, a belt, a *huipil de tapar*, and a necklace and earrings. Slight variations in clothing style occur among the villages dressing according to this general pattern, distinctions which are reflected in the wrap-around skirts made in Pinotepa de Don Luis. (Ryesky, 1977, pp. 129-30)

The hand-woven striped skirts, called *posahuancos,* are characteristic of the traditional female attire of the Mixtec Coast (Seibold, 1982). In the finest of these skirts, the blue cotton is indigo-dyed; the mauve cotton is *Purpura*-dyed; and the red or maroon silk is dyed with cochineal or the fruit of a cactus (Lechuga, 1982, p. 35). In 1993, the cost of such a skirt was one thousand new Mexican pesos (about five hundred Canadian dollars), a sum far beyond the reach of most Mixtec women.

Political support for the conservation of *Purpura,* as a resource of significance to Mixtec culture, derives from the paradoxical respect which Mexico accords its Native people. An important principle within Mexican ideology is that of the "Three Races" or the "Three Cultures." According to this concept, the three constituent elements of Mexican society are the indigenous Mexican, the European conquerors or oppressors, and the mestizo who resulted from contact between the two. The position of the Mexican Indian within this schema is a contradictory one: although Mexican society accords its Native peoples inferior social status and the concomitant reduced access to social benefits, it also accords them the ideological importance of being closest to the source of Mexican culture (Friedlander, 1975).

RESEARCH DESIGN AND METHODOLOGY

This study and its design were presented for review to the Ethics Review Committee of the Department of Clothing and Textiles, University of Alberta in May, 1993.

Participant observation, particularly informal ethnographic interviews, was used to collect information for this study (Spradley, 1979, 1980). The list of questions in the 'Interview Guide' (see Appendix B) was developed to serve as a checklist for the purpose of facilitating a somewhat structured and comprehensive approach to informal interviews. Field notes, audiocassettes, and photography aided in recollecting observations of daily life and special occasions. There are two main purposes for recording interviews. One is "for recording important interviews and ordinary conversations where one is hearing more than one could write down at the time, and the speaker's discourse is particularly rich in terminology and ways of expression" (Ellen, 1984, p. 203). A second reason to record interviews is that this provides, in a society where universal literacy cannot be assumed, a way of documenting that informants were advised of the nature of the research and their right to anonymity and confidentiality.

A Pentax Zoom 105R camera was used for recording images of people and places. Because the nearest photocopier was hours away, an unanticipated benefit of having brought this camera was using its 'super-macro' lens to photograph documents. Photographs which informants showed me made it possible to obtain information about events I had not attended, and even more vivid documentation was provided on audiovisual media. A 1991 Japanese program viewed in Pinotepa de Don Luis depicted Japanese shellfish dyeing as well as Mixtec, and a 1992 home videocassette by Antonio Hernandez Montano allowed me to see the dances, costumes and customs of the local Carnival festivities. Although making copies was difficult and expensive, the information which the videocassettes held made it worthwhile.

'Realia' were collected: a limited number of invertebrate specimens were taken at sites I visited, and a number of textiles and related artifacts were purchased and received as gifts. A significant benefit of such transactions was the information associated with the objects. For example, when I bought a *Purpura*-dyed *posahuanco* with accessories from Doña Teresa, she showed me how to put them on, and how Mixtec women tuck their money inside the folded palm-fiber portion of the belt.

Other information was gathered by studying documents, photographs and videocassettes. Visits to field sites permitted *in situ* observations of living specimens of *Purpura* and of the tourist development taking place in *Purpura* habitats.

Theoretical Framework

An examination of traditional models of natural resource management, as these might apply to *Purpura* suggests that the traditional system of Mixtec management of *Purpura* was effective because individual dyers were willing to subordinate their desire for short-term gain to the long-term benefit of the group as a whole. This appears to contradict a prevalent model in Western resource management, namely that of "The Tragedy of the Commons."

In "The Tragedy of the Commons", Hardin (1968) proposes an explanation for the decline of the medieval English grazing commons. As long as each user pastured only a few animals on the village commons, there was enough for all. But each additional animal a villager fed reduced what was available for the rest. Too many animals resulted in overgrazing, loss of productivity, and a breakdown of the system. This scenario was used to illustrate that, for effective management, such resources should be held as private property or belong to the state. From this model is derived much of the theoretical basis for Western resource management practice. However, this theory makes two critical assumptions: that common-property resources are open-access situations to which anyone may enjoy unrestricted access, and that "each resource-user places immediate self-interest above community interest" (Birkes, 1989a, p. 8).

Open-access situations where a resource has no owner and anyone may have legitimate access are extremely rare: "Whenever a society has needed a natural resource – whether medieval common-grazing lands in England or wild beaver in subarctic Canada – rules for its orderly use have been worked out" (Birkes, 1989a, p. 10). A resource may be privately-owned, either by an individual or a corporation; it may be state property (e.g. a national park); or it may be common-property.

> Common-property rights are a special class of property rights which assure individual access to resources over which they have collective claims. Common property is created when members of an interdependent group agree to limit their individual claims on a resource in the expectation that the other members of the group will do likewise. Rules of conduct in the use of a given resource are maintained to which all members of the interdependent group subscribe. (Gibbs & Bromley, 1989, p. 25)

As well, 'co-management' systems exist, where there is jurisdiction at both the state and local levels (Acheson, 1989).

Traditional Mixtec management of *Purpura* as a common-property resource seems to have resulted in sustainable resource use (Gerhard, 1962 & 1964; Nuttall, 1909). State-authorized exploitation by mestizo fishermen working for Purpura Imperial brought about mismanagement and over-utilization of *Purpura* (Turok et al., 1988), because conventional *laissez-faire* business practices favour maximizing short-term, tangible

benefits over longer-term, intangible ones (Goodland, Ledec & Webb, 1989).

One might hope that the Mexican protective legislation would succeed in limiting the use of *Purpura* to a well-integrated group of responsible users who would use knowledge derived from traditional and scientific sources to ensure sustainable resource use. From a more pessimistic perspective, one might expect that state management would be ineffective or counterproductive (cf. Freeman, 1989), that unauthorized and unrestricted use by outsiders would continue, and that there would be breakdown of management systems at the local level (cf. Goodland, Ledec & Webb, 1989).

Fieldwork

Preliminary fieldwork in the state of Oaxaca took place August 17-30, 1992. In Oaxaca City I met with colleagues working in the region; made use of resources at the Wilti Library for Oaxacan Studies; visited wholesale and retail crafts outlets, as well as cooperative artists' and artisans' markets; and I travelled to Huahuapan and Putla.

In 1993, I returned to Mexico to complete the fieldwork. My first *in situ* observations of *Purpura* occurred in Puerto Escondido. Approximately three weeks was spent in Pinotepa de Don Luis, conducting ethnographic research. I travelled to Puerto Angel, where I interviewed people doing *Purpura* research at the Universidad del Mar, contacted naval installations and government offices, and went to public and isolated beaches to observe *Purpura* habitats. In the Bahias de Huatulco area and in Santa Cruz, I observed the extensive tourist development taking place in the previously almost-uninhabited area of preferred dyeing sites.

Contact and Sampling Techniques

Contact with special respondents were sought through "snowball sampling" (Palys, 1992, pp. 148-149). In light of the restricted time available, key informants (Gorden, 1969) were particularly important. (See Appendix E.)

Rudy Leyva Carmona, whom I met while doing preliminary research, originated in Pinotepa de Don Luis, and has relatives who still live there. He and his father, Israel Leyva, were "gatekeepers" (Hammersley & Atkinson, 1983, p. 38-39, 63-68), who might have denied me access, but instead facilitated my entry into the community. Don Israel was, for many years, an influential resident of Pinotepa de Don Luis. He arranged accommodation for me with a widowed relative, Isabel Cruz de Leyva, who became another valued key informant. He also introduced me to municipal authorities and to the current head of the dyers' organization, Habacuc Avendaño Lopez, and his sister Teresa. Don Israel introduced me in a formal manner, stressing that my

interests were cooperative, not competitive, and that mutual benefit could result from working with me.

The consistently generous and cooperative response of informants may be attributed, in part, to my approaching, wherever possible, people whom I wished to interview by introduction from a known and respected third party. Without exception, people interviewed were advised of their right to privacy and confidentiality; they all emphasized their wish to be identified by name. This I have done, except for those few occasions where discretion seemed in the interest of the informant.

Currency

The desirability of a natural resource within a particular society is a significant aspect of its human ecology. Although concentrating on monetary values risks missing important non-commercial values, the price accorded a commodity may provide an operational definition of its worth. Care was taken to collect monetary information related to shellfish dyeing.

For decades, the Mexican peso was stable at 12.5 pesos to the American dollar, but in 1976 it was allowed to float. During the inflationary period which followed, the peso reached over 3000 to the American dollar. In recent years, it has remained relatively stable at that level. In early 1993, the 'new peso' was introduced, valued at one thousand 'old pesos'. Unless otherwise specified, prices are given in 'new pesos' (N$), valued at Canadian $0.48 as of August, 1993, when research was conducted in Pinotepa de Don Luis.

RESEARCH FINDINGS

The following section presents information about *Purpura* dyers, the dyeing process, use of the dyed yarn, and changes which were observed in the use of *Purpura* and its habitat. It describes the findings and analyses the relationship between dyers and their environment.

The Dyers of Pinotepa de Don Luis

In Pinotepa de Don Luis, craft specialization on the basis of gender is distinct. Women spin, weave, and dye using other dyes such as indigo, but only men dye with *Purpura*. The *Purpura* dyers (see Figure 1) are all Mixtec Indian men. Dyers vary considerably in age from about 18 to over 70: a few are youths or elders; most are middle-aged. Their dress is simple, but not shabby, and suggests that they are of the Indian racial caste. A good number, particularly older men, wear the white cotton pullover shirt and 'wraparound' trousers sewn from white cotton, which with local variations, comprises the uniform of rural Mexican Indian men. Others wear shirts and trousers of a more 'Western' cut. With rare exceptions, a person wearing traditional clothing may be assumed to be Indian. However, the reverse does not necessarily hold: on several occasions, young men said "Although I am wearing a shirt, I am [just] an Indian."

Purpura dyeing is seasonal part-time work. All of the dyers are agricultural workers, working their allocation of the community-owned land or as wage labourers. Adherents to a Roman Catholicism tolerant of syncretistic elements, their lives revolve around work in the cornfields, family and community. Increased population and lowered land production due to severe erosion make it difficult to achieve the ideal of self-sufficient agricultural subsistence. A few dyers have left Pinotepa de Don Luis to work elsewhere. (See Appendix D.)

The Dyers' Group

The Dyers' Group *(El Grupo de Tenidores del Caracol Purpura Pansa)* developed from earlier artisans' organizations within a context of community-oriented development programmes. About 1971, the local priest and the centre director of INI, the National Aboriginal Institute *(El Instituto Nacional Indigenista)*, began a workshop at the church, with the intent of producing locally-made textiles for an external market. When the priest left in 1973, INI organized a solidarity group of weavers (Ryesky, 1977, pp. 145-148). On November 8, 1984, with the support of the Local Committee for Ethnodevelopment *(Comité Local de Etnodesarrollo)* of INI, the Pinotepa de Don Luis Artisans' Committee *(Comite de Artesanos de Pinotepa de Don Luis)* was formed. Its first project, a co-operative artisans' market in Jamiltepec, failed to meet its objectives, but,

Figure 1. Dyers' group meeting at the Bilingual School, August 15, 1993.

when it appeared that *Purpura* was in danger of extinction, the organizational infrastructure was in place to support more politically-oriented action (Turok et al., 1988, pp. 152-153).

The first President of the Group was Don Feliciano (Chano) Cruz, who began *Purpura* dyeing in his twenties, and continued until his death on April 13, 1993, at the age of 88. Don Chano, who was highly regarded as a teacher of his craft, taught a number of others, including his son, Herminio Mario Cruz Perez, to dye. Don Herminio, 35, began dyeing at 24. He is cousin to Don Isaia Cruz Galan, a man in his eighties, who also is an experienced dyer (A. Flores Garcia, personal communication, August 24, 1993). Don Herminio, his father, and Don Isaia used to dye as a group, but now there are only two members left. He says he would like to teach his son (4-5 months) to dye, when he is old enough. Another son is 10, but Don Herminio does not think he will teach him to dye because, although this son is progressing satisfactorily at school, he is mute (H. Cruz Perez, personal communication, August 25, 1993).

Habacuc Avendaño Luis succeeded Don Chano as President. The significance and importance of government acknowledgment of the legitimacy of their claim to dyeing rights was evident almost immediately after I was presented to him. Don Habacuc stated that he was the president of the dyers' Group, and that it was they who were licensed to practise *Purpura* dyeing. Displayed on the walls of his late mother's home are photos of Don Chano, Don Habacuc and his sister, Doña Teresa, in the company of various dignitaries (including the last President of Mexico, Miguel de la Madrid) and a diploma which had been awarded to the artisans' organization (see Appendix C).

Don Habacuc, 52, wears a shirt and trousers, not traditional attire, and appears equally fluent in Mixtec and Spanish. He learned to dye as a youth. His teacher was Donato Plaza, now in his seventies. They continue to dye together with Santiago Sanchez, who is about 35. They are "working buddies", but are not related by either actual or fictive kinship (H. Avendaño Luis, personal communication, August 8, 1993). Don Habacuc is planning to take his seventeen-year-old son dyeing, but a son in his late twenties has shown no interest. (H. Avendaño Luis, personal communication, August 14, 1993).

The group meets fairly regularly, when there is something to discuss (H. Avendaño Luis, personal communication, August 14, 1993). Decisions are made by consensus. The first of two meetings I attended took place on August 15, 1993. By 10 a.m., a dozen men gathered at the Community Centre, including Don Habacuc. The language spoken at both meetings was Mixtec, with an occasional Spanish phrase. What I understood of the transactions derives from Don Habacuc's explanations, in response to my questions.

The meeting concerned N$400, which the Mexican government *(Secretario de Cultura: Programa Casas del Pueblo)* had given them to

buy yarn for dyeing during the next season. In Oaxaca, yarn costs N$50 per bale of 20 skeins; in Pinotepa de Don Luis, it costs N$90. The proposal for discussion was that Don Habacuc should go to Oaxaca to buy the yarn and that they would each contribute toward the cost of his trip (N$115 total). At noon, the group (now doubled in size) moved to the Bilingual School. (See Figure 1.) An older man, identified as an officer within the Mixtec civil-religious hierarchy, was present. After some discussion in groups of 6 or 7, people gave money to Santiago Sanchez, who made a list of contributors. Don Habacuc said that each person contributed N$5. He would buy eight bales of yarn.

The second meeting I attended took place on August 22. It was a meeting of weavers, gourd carvers, and dyers. There were over a hundred people there, about two thirds of whom were women. A number of women kept their hands (and feet) busy separating commercial six-strand embroidery thread, which is used two strands at a time for weaving, into separate lengths. Doña Teresa's hands never stopped moving, nor did the thread ever tangle as she delivered a lengthy and impassioned speech.

The objective of the meeting, she explained to me later, was to form a committee so that they could get capital from the government to buy yarn for their store. Officers were elected, some of whom wore mestizo, and some traditional attire.

The 35 kilos of yarn which Don Habacuc brought back from Oaxaca was distributed to dyers: six skeins each. (See Figure 2.) The yarn serves for one semester. There are two dyeing semesters per year.

The most tangible state support is the money to buy the yarn which was distributed to the dyers. In return for the N$5 which they contributed for transportation, they received yarn which has a retail value of N$30 in Pinotepa de Don Luis. The advantage to each dyer of purchasing yarn in Oaxaca is N$15.65. In addition, Don Habacuc may have profited by retaining one bale of yarn.

After the Aug. 22 artisans' meeting, I talked with two of the oldest dyers. (See Figure 3.) Don Odilon [surname unknown], in his eighties, began dyeing when he was a boy, and has gone dyeing "every year" since then. Andres Marcial Sanchez[1], is in his seventies.

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[1] Dona Artemia says that Don Andres is a *poseur* who has only been dyeing a few times in his long life (A. Flores Garcia, personal communication, August 24, 1993).

Figure 2. Distribution of yarn at artisans' meeting, August 22, 1993.

Figure 3. Don Andres (left) and Don Odilon with their yarn.

They both learned to dye not from a family member, but from a "friend", "a gentleman from Tututepec",[2] Rosalo Cortez. He taught many to dye, which he did not do for money, but "for enjoyment". Now, they are teaching others. They used to go dyeing in groups of five or six, and the snails were "bigger, with more dye." Now, there are "very few, but the colour is the same." Although there is less dye, "it's worth the bother" to go (Odilon, personal communication, August 22, 1993).

The Committee of Artisans and Purpura Snail Dyers *(Comité de Artesanos y Tenidores de Caracol Purpura)* of Pinotepa de Don Luis is one of the 19 participating organizations in the Mexican Network of Artisans and Eco-Producers *(Red Mexicana de Artesaneos & Eco-Productores)*. The only other organization in the network that appears to be involved with *Purpura* dyeing is the Nahua Artisans of the Michoacan coast *(Artesanos Nahuas de la Costa de Michoacan)* .

Don Habacuc knows of two dyers' organizations in Mexico. One is in Maruata, Michoacan. Don Habacuc says that their dyeing is less colourfast because they do not treat their yarn with soap before dyeing. The other Mexican dyeing organization is located in San Mateo del Mar, southern Oaxaca. He also said that dyeing took place in Costa Rica, but did not know whether it was in Nicoya or elsewhere (H. Avendaño Luis, personal communication, August 14, 1993). On the rare occasions when dyers from Pinotepa de Don Luis meet dyers from other areas, relations are cordial. They do not argue, but discuss their work. Don Habacuc was invited to address the Michoacan dyers (H. Avendaño Luis, personal communication, August 15, 1993).

About 25 people are members of the Group (H. Avendaño Luis, personal communication, August 14, 1993). The criteria for membership appear to be simple: to be a member, one must be a *Purpura* dyer from Pinotepa Don Luis. The government issues identification cards which document their occupations as dyers. Don Herminio showed me his card. (See Figures 4 and 5.) Even though he was aware that it had expired, it was obviously valuable to him and he was reluctant to lend it to me for photocopying. Credentials are mailed to the dyers. There is no charge for registration: "We are poor." His attitude indicated 'How could they ask us for what we don't have?' (H. Cruz Perez, personal communication, August 25, 1993).

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[2] This may explain why inhabitants of landlocked Pinotepa de Don Luis go to the ocean to dye. Being nearer to the ocean, Tututepec may have provided a link between Pinotepa de Don Luis and possible earlier dyeing by coastal people.

Figure 4. Card identifying Don Herminio as a registered dyer.

Figure 5. Reverse side of Don Herminio's identification card.

The Coast Guard have sometimes checked credentials in the past. If a person does not have credentials, he is asked to stop dyeing, or risk arrest (H. Avendaño Luis, personal communication, August 14, 1993; H. Cruz Perez, personal communication, August 25, 1993).

An Exception

My first interview as such, and possibly the most significant one in Pinotepa de Don Luis, was not one I would have anticipated. The informants were selected by my landlady, Doña Isabel. She chose them because personalized relations existed between her and them within the system of fictive kinship. Doña Isabel and Sra. Amalia Marin de Mejilla are co-godparents, Doña Isabel having taken on the responsibility of being godmother to two of Doña Amalia's daughters.

Catalino Cortero is a fisherman from Puerto Angel, who is married to the eldest of Doña Amalia's daughters, Aurelia. He came to Pinotepa de Don Luis in August, 1993, to try to obtain a "friendship permit" to join the dyers' Group.

A few years ago, Don Catalino appeared in a Japanese film about *Purpura* dyeing. In 1984, Don Catalino's wife and her sister Graciela, went to Japan to demonstrate their weaving skills. They went as part of a traveling exhibition of craft workers which spent a week each in Kyoto, Nagoya, Tokyo, Osaka and Yokahama, Japan (S. Mejilla Marin, Aug. 22).

In spite of, or perhaps because of his inebriation, Don Catalino was unusually eager to share his knowledge of *Purpura* dyeing. There were two pieces of knowledge which he emphasized. The first was that the "milk" from the snail comes out white, then is changed by the sun to green, and then to purple. The second was that the purple dye is "permanent" and "eternal": that "not even chlorine bleach" would remove it.[3]

Don Catalino stated that he began dyeing because his wife, like other women from Pinotepa de Don Luis, is "hard-working." Then, he began to send skeins of dyed yarn to her family in Pinotepa de Don Luis. When asked why more people in Puerto Angel did not dye, he said that the women there were not weavers. When I asked him why people from Puerto Angel did not dye for sale in Pinotepa de Don Luis, he said he did

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[3] Later, from a piece of white cotton and nylon cloth which I had dyed with *Purpura*, I took a small, apparently uniformly-dyed sample, which I cut in half. One half was saturated with undiluted domestic chlorine bleach; the other half was left alone. After about three hours, when the treated sample was dry, comparison of the two samples demonstrated that moderate fading had occurred in the treated sample: the colour was about half as intense as in the untreated sample.

not know, but Doña Amalia smiled broadly at the thought of buying *Purpura*-dyed yarn from a stranger.

Don Catalino said that when he approached the Fisheries Office in Puerto Angel for permission to dye, they referred him to the dyers' Group in Pinotepa de Don Luis. To become a member of the Group requires group consent. Don Catalino's bid to join the guild was, apparently, unsuccessful. He said that two or three of the dyers who opposed his joining did so on the grounds that he was not from Pinotepa de Don Luis and did not know anything of such things, and that, because he knew how to swim, he would take more than his share.

His main reason for wanting to join the Group is that a person dyeing alone has no one to help him if he gets hurt or into trouble, and no one to recover his body and see that he gets a decent burial if he is killed (C. Cortero, personal communication, August 9, 1993). The problem is not a hypothetical one. A brother in the Mejilla family, Eliseo Velasio was killed in 1983, while dyeing in Santa Cruz. He fell from a rock and, not knowing how to swim, was drowned (S. Mejilla Marin, personal communication, August 22, 1993).

Don Catalino said that he had hoped that he and the dyers' Group could convince the local authorities in Puerto Angel to try to stop the people there from eating *Purpura*. As well, he said that "rock people" are collecting *Purpura* for use as bait.

He further stated that before the Japanese [i.e. Purpura Imperial] came, there were "very many" *Purpura*; now there are "very few". In his opinion, it was not the Japanese who were responsible for the *Purpura* population problems, but rather the mestizo fishermen working for Purpura Imperial, who behaved as they had because of ignorance.

The Dyeing Process

According to Gerhard's classic (1962) account of traditional Mixtec dyeing techniques:

> White cotton is grown locally, carded and spun by women of the village. It is then put up in skeins each containing about 100 meters of paired single yarn. The white thread is sold to the dyers for two pesos a *libra* (reckoned at half a kilo). It is prepared for dyeing by washing it in soap and water.
>
> About twelve men and boys go down to the coast every year, each carrying some fifteen pounds of thread. They travel in groups of two or more, the first group leaving Pinotepa around the beginning of November. At one time they used to work near Acapulco, but now the preferred area is the thirty miles of coast between Puerto Angel and Barra de Copalita, where there are many sheltered coves with rocks, an ideal habitat for *P. patula*. The spring tidal range is about six feet, and dyeing is done preferably at

the morning low tide. It is said that better results are achieved when the moon is fairly full, but some dyers go out at new moon also. Each man carries ten or twenty skeins of cotton slung under his arm, and a pointed stick to reach less accessible mollusks. They work slowly along the shore, examining the shady undersides of the rocks at water level where the snails are exposed. When a colony of *Purpura* is found, the dyer prizes off a snail and blows on it. This causes the annoyed animal to recede, and immediately the frothy liquid comes welling up to fill the mouth of the shell. It is then poured and dabbed onto a skein, after which the snail is gently returned to a rock nearby. At first colorless, the dampened cotton exposed to the air and sun soon turns a dirty yellow, then bright green, and finally a rich if somewhat uneven purple. In full sunlight this change occurs in two or three minutes, but if it is overcast it takes longer. Normally the liquid of half a dozen full-grown snails is enough to dye one skein of cotton. On returning to camp, the dyers spread out the purple thread in the sun where it is left all afternoon, and then overnight to absorb the dew. This is supposed to make the dye faster and more even.

For a month the dyers work their way along the coast from one bay to the next. In the following moon they return to the first bay and start 'milking' the snails a second time, until all their skeins have received a single application of dye. Only rarely is the same thread dyed twice, to make the color more even. Finally they shoulder their ill-smelling burdens, now considerably increased in weight and trudge back to Pinotepa de Don Luis. As the first group of dyers finishes its work, a second arrives to go over the same stretch of coast. Sometimes the dyeing is completed by the end of February, but often a third group continues working through April.

On arriving at their village, the dyers sell the purple yarn (Mixtec, *tishinda cayi huhva*) for anywhere from forty to sixty pesos a pound, depending on the relative evenness of the color. Allowing for the added weight of the dye, a skilled worker can thus earn as much as 1,200 pesos for two months' work, a considerable fortune in that part of the country. Some thread is sold in Huazolotitlan, but most is bought by the women of Pinotepa de Don Luis, nearly all of whom are weavers. (pp. 184-185)

In 1981, a Japanese company named Purpura Imperial, S. A. began to pay coastal mestizo fisherman to collect *Purpura* dye. The methods they used were considerably more aggressive than traditional methods, resulting in very efficient collection of the dye for a short while, and catastrophic reduction of the Purpura populations which had been used on a sustainable basis by the Mixtec dyers. In December 1983, Purpura Imperial obtained a one-year permit to dye from the Secretary of Fisheries *(Secretaria de Pesca)* (Turok et al., 1988, pp. 13-14). There was even intimidation of Mixtec dyers by people who claimed that only Purpura

Imperial was legally authorized to engage in shellfish dyeing (Turok et al., 1988, p. 137). As a result of protest by artisans from Pinotepa de Don Luis and investigative activity by the Crafts and Popular Cultures Programme *(Programa de Artesanias y Culturas Populares)*, the permit was not renewed, and Purpura Imperial suspended its Oaxacan operations (Turok et al., 1988, p. 14).

Records as early as 1547 indicate that Pinotepa de Don Luis produced a significant quantity of cotton (Ryesky, 1977, p. 30), but only a small amount is now grown. Three species of cotton are cultivated, white cotton and two species of cotton prized for their tawny colour. One variety of tawny cotton grows on a tree; the other grows on a short plant. Although I saw a number of women process[4] and spin cotton, I observed only the production of tawny yarn, even though only white yarn is dyed. Commercially-produced quarter-kilo skeins of unmercerized[5] two-ply white cotton yarn may be purchased from fixed or itinerant retail sources, or received as a grant from the government. In the 1980s, workers for Purpura Imperial dyed onto skeins of Japanese natural silk[6] and also collected the dye itself into containers for export (Turok et al., 1988, p. 13), a much less frugal use of the dye. In 1993, Sra. Franco imported a small quantity of German silk yarn which she was having *Purpura* dyed (M. Franco Villafane, personal communication, August 23, 1993).

Before dyeing, the skeins of undyed cotton are washed by the weaver "with soap made from ashes and beef-tallow." The soapsuds are left in the skeins: they are not rinsed.[7] Within living memory, this soap was made in a number of villages, sold by two people in Pinotepa de Don Luis, and used for all kinds of washing. Now, it is made only in Tlacamama,

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[4] The seeds (larger than an apple seed) are removed by hand. When enough cotton has been cleaned, it is beaten on a dry banana leaf, to make it into a rolag (A. Marin de Mejilla, personal communication, August 9, 1993). It is customary to avoid beating cotton for a period of a year in a house where a death has occurred, in order not to molest the spirit of the departed one (T. Avendano Luis, personal communication, August 11, 1993).

[5] Although cochineal-dyed silk thread is prized for its lustre, there is a consistent preference for relatively dull, unmercerized cotton thread for dyeing. This may derive from a preference on the part of wearers for thread which resembles handspun thread, or it may reflect a preference for thread with greater absorbency, which would result in more intense dyeing.

[6] While the consistent Mixtec preference for cotton may be one of tradition, it is also possible that they have noticed that silk is degraded by the application of an alkaline solution.

[7] I hypothesize that an alkaline soap residue may slow down the photo-reduction of the dye, facilitating greater dye penetration into the yarn and deeper dyeing.

which lies about 1 hour away by truck from Pinotepa de Don Luis, and is sold in Pinotepa de Don Luis by a woman who visits once a month. If the skeins are washed with commercial soap, they fade (A. Marin de Mejilla, personal communication, August 9, 1993). Because an unwieldy skein of yarn, heavy with moisture, is a hazardous burden on the slippery rocks at the dyeing sites, Don Herminio prefers an additional process before he takes the yarn to be dyed. As a safety measure, his wife rewinds the yarn into a number of small skeins (H. Cruz Perez, personal communication, August 25, 1993).

In the past, each person dyed 15-20 kilos per season. In 1992-93, they dyed about 1 1/2-2 kilos per season (H. Avendaño Luis, personal communication, August 15, 1993).

For lack of a significant market, there are probably fewer mestizo dyers than the 16 reported by Turok et al, (1988, p. 134). The number of Mixtec dyers has increased, from 12 (Gerhard, 1962), to 17 (Turok et al., 1988, p. 134), to approximately 25 current members of the dyers' Group. There are probably more Group members than active dyers (see Note 1). Members of the Group tend to be older than the population as a whole. The size of the groups that go dyeing seems to be decreasing, through attrition. As elders are lost, new members are not recruited to replace them (H. Cruz Perez, personal communication, August 25, 1993). Perhaps there are not enough *Purpura* to make it worthwhile for a person to go as part of a large dyeing group, and more groups of smaller size are going.

Once, access to the dyeing area was difficult (by footpaths, with burros or carrying all their materials and supplies themselves), and infrastructure (shelter, water) constituted an important limiting factor. Now, transportation and access are easier. For example, when Don Habacuc began dyeing as a youth, it was an eight day journey to the coast, carrying skeins of yarn and all their provisions (H. Avendaño Luis, personal communication, August 8, 1993). In Puerto Angel (see Map 1), Don Catalino's father, Cantido Cortero, used to "give shelter" to dyers from Pinotepa de Don Luis (S. Mejilla Marin, personal communication, August 22, 1993).

Don Habacuc said this year they would probably go to Pinotepa Nacional, then to Puerto Escondido or Pochutla by pickup truck fitted to carry passengers in the back. A preferred place is San Augustin, which is about an hour on foot from Huatulco, but a bus also goes there. (See Map 2.) Because it is a "tourist zone", there has been much road construction recently. They would begin dyeing at San Augustine, and continue eastward to Santa Cruz (H. Avendaño Luis, personal communication, August 15, 1993).

The Group's permission to dye extends from Zapotalito (Cerro Hermoso is the dyeing site) to Santa Cruz (Barra de Copalita) (H. Avendaño Luis, Aug. 14, 1993). In Don Habacuc's youth, the best places

Map 2. Dyeing Areas and Tourist Development, Bahias de Huatulco. This zone contains the best *Purpura* dyeing localities and approximately one half of the Oaxacan *Purpura* habitat.

for dyeing were from Puerto Angel to Copalita. Puerto Escondido and Cerro Hermoso reportedly were good also, but Punta Cometa was not as good. Although most of the Mexican Pacific coastline is smooth and has sandy beaches, these localities all are characterized by a rougher, rocky coastline.

Many of the locations they used to go to are now "closed beaches". For example, they used to dye at Tangolunda, but not any more "because now there are so many hotels; now, they do not leave [one alone]". It used to be "alone, quiet", "a group of huts" where "only one person" lived (H. Avendaño Luis, personal communication, August 21, 1993).

Within the zone from Puerto Angel to Copalita, dyeing is performed from San Augustin. First, one goes to Playa de Riscalillo, then to Playa de Jicaral, Chachacual, La India, El Mulato, Arroyo Seco and Cacaluta. Dyers travel to San Augustin and Cacaluta by footpath. Conejo is "very high". Near Huatulco, one enters the dyeing area via Commano. In El Organo and El Maguey, Don Habacuc has heard, there are "very few snails", but he says that he never has gone there; he does not know those locations (H. Avendaño Luis, personal communication, August 21, 1993).

Purpura dyeing is a very hazardous occupation. The rocks are slippery, and waves crash against them unpredictably. None of the dyers from Pinotepa de Don Luis has learned to swim because there is no suitable body of water near there in which to learn. Three people have drowned while dyeing over the last 10-12 years: Francisco Hernandez, Eliseo Mejilla, and Alcesio [surname unknown] (H. Avendaño Luis, personal communication, August 14, 1993).

On the exposed rocky marine shores of the dyeing areas, the snails shelter during low tide in crevices, under boulders and in surge channels. *Purpura* are found most commonly in the high and high-mid intertidal zones (Garrity & Levings, 1981, p. 269) , and therefore it does not require extreme intertidal conditions to collect them. Dye may be collected any day of the month, but, because of the potentially-fatal consequences of even a small error, it is best to dye when the tide is low. Collecting at the new and full moons ('spring tides') gives the dyer more time and greater safety because the sea level is lower. The tide range is at a maximum when the moon is new and when it is full, resulting in extreme and prolonged low tides. Dyers use "signal rocks" to judge the height of the sea. They recognize that the functions of the tides and the moon are related: "Full moon, full sea" (H. Avendaño Luis, personal communication, August 14, 1993).

During the dyeing season a new group leaves Pinotepa de Don Luis for the coast every month or 6 weeks. Dyeing occurs between October or November and April. December, when the ocean is calmest, is the best time to dye (C. Cortero, personal communication, August 9, 1993). The men usually sleep on the beach when dyeing. During the rainy season, from May to September, lack of shelter prevents people from dyeing. They

cannot sleep on the beach because it is raining. In May, the fierce storms of the rainy season begin (H. Avendaño Luis, personal communication, August 14, 1993), and the wave height increases. When a wind called "*El Norte* " ("The North") blows, waves increase for 2-3 days, and they cannot dye (H. Avendaño Luis, personal communication, August 14, 1993). When it rains, the dyeing is more dangerous because the rocks are slippery (H. Cruz Perez, personal communication, August 25, 1993).

The only traditional tool required[8] for dyeing is a stick, shaped to spatulate form at one end, which is used to detach the snails from the rocks. The sticks are made from a piece of wood cut at or near the dyeing site. Whether of acacia (Turok et al., 1988, p. 137) or mangrove, probably *Rhizophora mangle*, (H. Avendaño Luis, personal communication, August 14, 1993; Little & Wadsworth, 1964, 384-385), the wood chosen for this use is hard and durable.

Although the mestizo fishermen harvested dye from snails of all sizes, the Mixtec prefer large snails (6-8 cm) when they are abundant (Turok et al., 1988, p. 137), because larger snails yield more dye. In 1992-93, however, there were few snails, and they were small (i.e. less than about 30 mm, the size at which they reach reproductive maturity and may legally be used for dyeing) (A. Guzman, personal communication, August 18, 1993).

When a suitable snail is found, the Mixtec dyers spit or blow onto the operculum to expel the dye. They pour and dab the dye directly onto the yarn, timing their actions to make best use of the dye (Turok et al., 1988, p. 134). It takes 3-4 hours to dye a skein[9] (Cortero, personal communication, August 9, 1993). The *Purpura* dyeing process is often discussed in terms analogous to milking an animal. The term most commonly used for the activity of dyeing is 'to milk', and the exudate is described as being 'like milk'. The mestizo fishermen-dyers used more aggressive techniques: they would thrust a thumb forcefully into the snail's aperture. A misconception that the dyers break the snail's shell, or slit one of its veins in order to extract the dye (resulting in the death of

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[8]The capital investment is small, compared with that of Purpura Imperial, which included two boats with outboard motors, rubber gloves, thermosses, and metal rods (Turok et al., 1988, p. 134).

[9]Catalino said that when the dye is fresh, the smell is so strong "to make one's head hurt." The consensus among one interview group was that it smelled most like "a small, dead animal" (I. Cruz de Leyva, personal communication, August 10, 1993).

Doña Teresa (personal communication, August 26,1993) reflected more typical opinion when she said that it smelled of "the sea." Once, I said to her, in Spanish, that some people (cf. Gerhard, 1962; Saltzman, 1992) thought that the characteristic smell of *Purpura* dye resembled that of garlic (*ajo*), she did a double-take and said a word which sounded to me like "*ajo*", but which she said was Mixtec for "the sea."

the snail) prevails among some people who are less familiar with the process (Museo Serfin, 1992; R. Leyva Carmona, personal communication, August 6, 1993).

If the substrate yarn dries out before the process of photo-oxidation is complete, the dyeing process is arrested. Catalino Cortero (August 9, 1993) showed me a skein of yarn (see Figure 6) which remained partially green, where it had been tied. He said that if it were re-dampened, the dye would became fully purple.

Most yarn gets only one application of dye, but yarn of the best quality has been "twice-bathed", dyed a second time. to intensify the color. This is done only by special request, for which the dyer might ask N$350 (T. Avendaño Luis, personal communication, August 14, 1993).

The Mixtec dyers I spoke with consistently displayed incredulous contempt for the fishermen-dyers who, after taking dye from a snail, failed to leave the snail in a crevice, splashing the snail with water so that it stays damp. They were aware that if the snail is left on a rock or thrown onto the beach or into the sea, it easily is vulnerable to predation.

> The temperature of exposed, homogenous substrate may approach 50°C during sunny low tides in both the wet and dry seasons. Groups of *Purpura* placed experimentally in the open in the high-mid zone at the start of a daytime low tide showed distress (gape) within 1 h, reached internal temperatures similar to those of the adjacent substrate and became moribund before the incoming tide reached them. (Garrity & Levings, 1981, p. 274.)

The motivation for dyeing provided by Purpura Imperial was monetary: their dyers worked on a piecework or premium incentive basis (Turok et al., 1988, pp. 13, 132, 136). In contrast, the Mixtec view dyeing in terms of more personal economic and social interactions. Access to dyed yarn is dependent on developing a personal relationship with a dyer. Almost no dyed yarn is available for sale to the general public. Most dyeing is done for the dyer's sister, wife, or daughter (T. Avendaño Luis, personal communication, August 14, 1993). Don Catalino "does not sell to everybody, only to the weavers" (S. Mejilla Marin, personal communication, August 22. 1993). Don Herminio does not dye the yarn for sale, but "for *her*." His wife uses the yarn to weave *posahuancos* and smaller textiles (H. Cruz Perez, personal communication, August 25, 1993). Soledad Mejilla Marin (personal communication, August 22, 1993) said that she recently bought *Purpura-dyed* yarn from someone to whom she was not related. It had cost her N$50 per half-skein, but was currently selling to others for N$150 per skein. This is about 15 times the price of an undyed skein (C. Cortero & A. Marin de Mejilla, personal communication, August 9, 1993). Doña Theresa paid Don Habacuc $N100 each for the two quarter-kilo skeins of *Purpura*-dyed yarn in the

Figure 6. Yarn with arrested photo-oxidation of dye.

posahuanco I purchased from her, but the price to others would be N$200-300 per skein (T. Avendaño Luis, personal communication, August 14, 1993).

Purpura-Dyed Textiles

Changes in the resource management of *Purpura* and its habitat have reduced the amount of yarn being dyed. As a result, there have been changes in the production and distribution of textiles.

Traditional Clothing

Generally speaking, the Mixtec people of Pinotepa de Don Luis show a flexible response to change which nourishes the vitality of their culture (Jansen, van der Loo, & Manning, 1988). Just as syncretistic religious, cultural, and linguistic practices maintain traditional beliefs, customs, and languages, the selective use of non-Mixtec textile practices allows the continued use of their own way of dressing. Notwithstanding the availability of non-traditional clothing, and pressure to wear it from some sectors of the society, a substantial number of Mixtec people continue to wear a somewhat modified version of traditional clothing.

There is a tendency toward conservatism in dress among older Mixtec men and women, but it would be erroneous to assume that people wear traditional clothing because they do not know or have no access to Western attire. Photos taken in Japan in 1984 of Doña Amalia's daughters, Graciela and Aurelia, demonstrating their weaving skills, their attire is traditional. They now wear mestizo clothing and hairstyles, but their mother and younger sister, Soledad, prefer modified traditional attire (S. Mejilla Marin, personal communication, August, 22, 1993). At the meeting of craft workers on August 22, 1993, evidently literate young women displayed the same traditional attire, skills, and energy as the older women there.

Although a child without a uniform will not be denied schooling, there is strong social pressure for them to be thus attired, and parents will suffer considerable privation in order to provide their children with uniforms. This is as true at the bilingual school as at the Spanish-speaking schools (M. I. Leyva Cruz, personal communication, August 12, 1993). The children I saw in Pinotepa de Don Luis wore clothing of mestizo style on almost all occasions. Although Don Manuel said that the young girls who sell tortillas in the morning wear traditional clothing (M. Hernandez Sumano, personal communication, August 21, 1993), none of those I saw did. The only time I saw a child wearing traditional clothing, it was my landlady's granddaughter, dressed up in party dress, "like a little Indian" (I. Cruz de Leyva, personal communication, August 14, 1993). (See Figure 7.) Otherwise, all female children I observed in Pinotepa de Don Luis wore either a dress or T-shirt or blouse with skirt or shorts. I did not observe any male children wearing traditional clothing.

Figure 7. Melissa in "Indian" costume.

The *posahuanco* (Sp. *enagua*) is virtually synonymous with traditional Mixtec women's clothing of the Oaxacan coast. Traditionally, the major use of *Purpura*-dyed yarn was as an important component ofthe *posahuancos* of Pinotepa de Don Luis. Because of the importance of *posahuancos*, both semiotically and as the major product of *Purpura*-dyed yarn, the following description and discussion of them in sociocultural context is a detailed one.

The *posahuanco* is a firmly woven, rectangular cotton textile, worn as a wraparound skirt, held in place by a belt in two sections (Turok et al., 1988, pp. 54-69). Most *posahuancos* are about 110 cm long by 165 cm wide, composed of three loom-width "legs" (i.e. pieces woven with four selvages to the desired length on a backstrap loom) sewn together lengthwise. (See Figure 8.) Doña Teresa, about 45, says she remembers a time when she was so young that her *posahuanco* was only two "legs" wide, and "almost everyone" wore *Purpura*-dyed *posahuancos* (T. Avendaño Luis, personal communication, August 16, 1993).

All *posahuancos* are warp-striped.[10] Naturally-dyed colours used for the warp of *posahuancos* in the style of Pinotepa de Don Luis include the violet of *Purpura*-dyed cotton; burgundy, ideally cochineal-dyed silk; and the indigo-derived dark blue usually referred to as black. The weft is also black. More and more, *posahuancos* are woven from commercially-dyed unmercerized cotton embroidery thread (used 2 strands at a time), instead of naturally-dyed yarn.

The relative proportions of colours used in a *posahuanco* convey significant information about the affiliations and social status of the person wearing it. The colours used in a *posahuanco* worn as a sign of mourning[11] (M. I. Leyva Cruz and I. Cruz de Leyva, personal communication, August 10, 1993) are different from those of other *posahuancos*. There is more black, with narrow stripes of mauve and

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[10]Turok et al. (1988, p. 57) classify *posahuancos* into two types. According to them, one style of *posahuanco* is used for burial; the other is worn as bridal attire. In the second type, the usually simple warp figuring is elaborated to resemble the designs on the wool belts woven by Mixtecs from the inland high country. I was unable to verify that differences in ornamentation signify functional differences. Few people make figured *posahuancos*, but a few prefer them. They wear them "for the fun of it", rather than for any ritual reason. "Right now, it's the fashion" (S. Mejilla Marin, personal communication, August 22, 1993).

[11]Doña Theresa wore a mourning *posahuanco* frequently, even though it was not required of her. She said that she wore it "because she liked to" (T. Avendaño Luis, personal communication, August 16, 1993).

Figure 8. Doña Teresa showing the *posahuanco* she had for sale.

dark red. A royal blue[12] may be used instead of red. The cost of yarn for a mourning *posahuanco* is lower because there is a higher proportion of relatively-inexpensive indigo-dyed yarn (S. Mejilla Marin, personal communication, August 22, 1993).

In much of the Costa Chica, the *posahuanco* striping pattern indicates the residence of the wearer. They are produced in Pinotepa de Don Luis for women living in a number of neighbouring towns.*Posahuancos* woven for other villages seldom contain snail-dyed yarn, but some of them use substitutes. The *posahuancos* of Jicayan are black, with equal stripes of red and mauve "like snail [-dyed yarn], but of commercial yarn" slightly darker in colour and more even (M. I. Leyva Cruz and I. Cruz de Leyva, personal communication, August 10, 1993). Usually, the women of Jamiltepec wear white skirts, but, for special occasions, they wear *posahuancos* from Pinotepa de Don Luis. They did not use *Purpura*-dyed yarn: instead, "it was coloured with a tablet", using a dye which was not fast. (See Figure 9.) Now, commercial embroidery thread is used (T. Avendaño Luis, personal communication, August 16, 1993). Other towns specify striping patterns in a subtly-distinguished variety of reds. Because of the use of indigo dye, colour differences between black and blue brought about by fading are not semantically meaningful (S. Mejilla Marin, personal communication, August 22, 1993). Many people can describe the *posahuanco* patterns of some towns, but only a few knowledgeable individuals can do so comprehensively.

The quality of a *posahuanco* is judged first of all by the quality of the yarn, particularly the permanence of the dyeing. Also significant is how firmly the cloth is woven and the size of the piece: both factors indicate the use of greater quantities of yarn (T. Avendaño Luis, personal communication, August 16, 1993). Another of the ways the technical quality of a *posahuanco* is judged is by the narrowness of the area of slightly irregular tension near the finishing of the fourth selvage. Doña Teresa (personal communication, August 14, 1993), pointed out that the one she was offering me had a finishing area only as wide as two fingers.

Doña Isabel says that her servant, Jovita, weaves herself a new *posahuanco* about every two years. A newer one is generally kept for special occasions. Most women have two; some have as many as four or five. A particularly good one will last about four years. Those used every day are washed about once a week (I. Cruz de Leyva, personal communication, August 15, 1993). When new, they are washed with water only. Jovita refuses to use soap on hers until it becomes rather well-used (I. Cruz de Leyva, personal communication, August 11, 1993).

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[12]I saw only synthetically-dyed royal blue yarn, but it is possible that previously the colour was derived from a relatively light application of indigo.

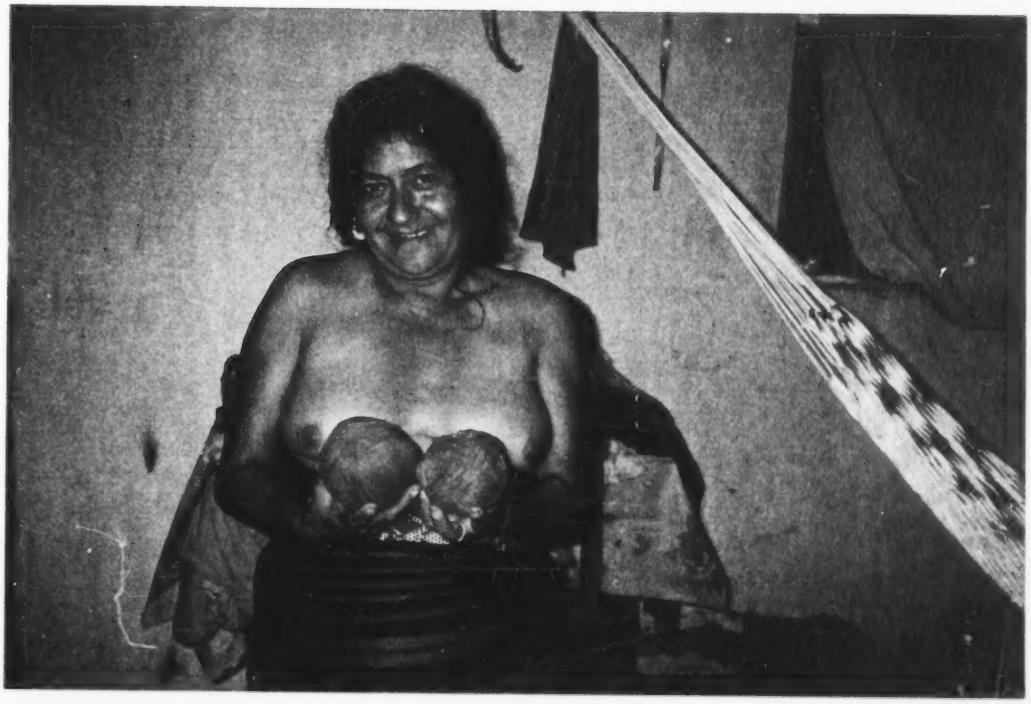

Figure 9. The "tablet"-dyed yarn of Jicayan (left) and *Purpura*-dyed yarn.

Maria Isabel showed me her *'posahuanco'*, an A-line skirt cut and stitched from a more conventional *posahuanco*. She said that she sometimes wore it when teaching, and that it would be considered appropriate attire for even the most conventional office (M. I. Leyva Cruz, personal communication, August 10, 1993).

Weaving

"Rare is the woman who cannot weave" (I. Cruz de Leyva, personal communication, August 15, 1993). Whenever I asked why the Mixtec women of Pinotepa de Don Luis weave not only for their own use but also for sale to women of other communities, or asked why women of other communities do not weave, the answer (regardless of the respondent's gender or town of origin) was always that the women of Pinotepa de Don Luis are "industrious".

The weavers of Pinotepa de Don Luis show an entrepreneurial and venturesome spirit. They experiment with new products (such as narrow sashes and zippered bags), and show a willingness to try new materials and techniques. For example, "tube" or "cone" yarn, resembling thread sold for use with a serger, was used for the warp of a blouse. A series of small textiles[13] may be woven on a backstrap loom on a long single warp, as Soledad Mejilla Marin was doing, August 22, or a single small textile with an uncut, looped fringe may be woven on a short warp. An additional source of innovative thought may have been outsiders, such as the Japanese people who were in Pinotepa de Don Luis some months earlier, investigating ways to produce *posahuancos* more quickly than the 8-15 days it currently takes (M. A. Leyva Cruz, personal communication, August 9, 1993).

The Amusgos, who are another Native Oaxacan group, use *Purpura*-dyed yarn as a supplementary weft. This produces a violet-on-white design. (See Figure 10.) Compared to using *Purpura*-dyed yarn as a warping structural component of *posahuancos*, using it to make an applied design on an undyed ground is a frugal use, in that it obtains maximal effect from a small quantity of a scarce material. The Amusgo style of weaving has been adopted in Pinotepa de Don Luis, for making textiles other than *posahuancos*.

Marketing

Posahuancos and small textiles are sold to Indian women from other towns at festival or local markets. Mestiza women purchase small textiles and domestic textiles such as runners, tablecloths, and bedspreads. A tablecloth or bedspread of commercially-dyed yarn, measuring 3 loom widths by 3m long costs about N$350. Most such items were woven from white cotton yarn, with supplementary weft designs

[13]"Serviettes" were used to cover or wrap things, especially food, because flies were abundant and lidded vessels were uncommon.

Figure 10. Silk and *Purpura*-dyed cotton garment woven in Amusgo style.

woven of commercially-dyed yarn. In some cases, the coloured yarn was cotton, but acrylic yarn was preferred for the intensity and fastness of its colours. With persistence, it was possible to buy textiles containing naturally-dyed yarn, but few mestizo customers request it.

One *posahuanco* vendor was observed at the August 14 holiday market. She sat on the sidewalk at the entrance to the permanent market building, with her folded merchandise displayed around her. By 4 p.m., according to Don Manuel, who has a dry goods store at the same market entrance, she had not had a sale all day (M. Hernandez Sumano, personal communication, August 14, 1993). He seldom buys textiles,except for a few small ones and occasionally a *posahuanco*, when one is offered him at a good price. He says that prices range from N$150-200 for an ordinary *posahuanco* to about N$800 for a nice one with shellfish-dyed yarn (M. Hernandez Sumano, personal communication, August 21, 1993).

"But mine is of *Purpura*", said Doña Teresa (personal communication, August 13, 1993), as a society matron, discussing jewelry, might say "Hers is pretty, but mine is real." I bought a *Purpura*-dyed *posahuanco* for N$700 from Doña Teresa. (See Figure 8.) *Posahuancos* of synthetically-dyed cotton yarn are less expensive than those dyed with *Purpura*. The cheapest ones cost N$80, an ordinary one will cost about N$250-300, and a *posahuanco* of synthetically-dyed cotton yarn of the highest quality costs about N$500 (M. I. Leyva Cruz, personal communication, August 10, 1993). Jovita once offered to sell hers for N$350, which was seen as very low (S. Leyva Cruz, personal communication, August 10, 1993). Via Doña Isabel, Jovita said that the commercial 6-strand cotton yarn costs N$15 per box of 25 small skeins. It takes 6 such boxes to make a *posahuanco*. She says that the big skeins cost N$25 each (I. Cruz de Leyva, August 24, 1993).

Marisella Franco buys *posahuancos* and other woven goods for sale in Mexico City (T. Avendaño Luis, personal communication, August 11, 1993). She pays N$250 for a dozen well-made small textiles embellished with *Purpura*-dyed thread, but accepts only work of high quality (S. Mejilla Marin, personal communication, August 22, 1993). She is evidently a busy person: a number of artisans were at her home when I arrived, more kept arriving, and she did not hesitate to carry on protracted conversations in Mixtec while I was there. Evidently, she is a collector, as well as a dealer: there were hand-carved furniture and *objects d'art* on display; through an open door, I could see a room filled with stacks of textiles. She buys textiles from people here, and sells them to the Museum of Arts and Popular Crafts (*Museo de Artes y Industrias Populares*) in Mexico City. In years gone by, her mother and older sister, Lucila, assisted the Cordrys (1968) and bought textiles for museums and such collectors as Luis Marquez, "since the Museum of Anthropology was in the Mint." Doña Lucilia said that there is no more old material available, and that textiles are disappearing from museum collections (L.

Franco Villafane, personal communication, August 23, 1993; Martínez-Ostos & Bayne, 1989, p. 47). Doña Marisella has been buying silk yarn from Germany and having it shellfish-dyed and woven in Amusgo style. One blouse-like garment from Pinotepa de Don Luis was woven of silk and *Purpura*-dyed cotton. (See Figure 10.) It would sell for N$2-3000 at the Museum of Arts and Popular Crafts (M. Franco Villafane, personal communication, August 23, 1993).

Changes in Resource Use

Bahias de Huatulco

Bahias de Huatulco is a multi-billion dollar international tourism development project which started in the mid-1980s. The location chosen for development is the spectacularly beautiful series of small bays within a stretch of rocky coast near Santa Cruz, once a quiet rural town of less than 5,000. (See Figure 11.) This rocky coast is also a favourable habitat for *Purpura*. It includes most of the sites used by the dyers of Pinotepa de Don Luis.

> The FONATUR development of the Bahias de Huatulco, a government megaresort on the nine pristine bays of Huatulco, is an ambitious project that includes 124,000 acres of land, mostly undeveloped. The small communities of locals have been transplanted away from the coast into Crucecita and Santa Cruz, and corporate giants are vying for the rights to huge parcels of prime, pristine bayfront jungle.
>
> After the turn of the century Huatulco is supposed to have over a million visitors each year. Right now, there are three luxury resorts, another under construction, several mid-range hotels, about a dozen restaurants, and a few tourist amenities.
>
> For a sampling of the luxurious Huatulco of tomorrow, take a cab from Santa Cruz to Tangolunda Bay, the focal point of development for the nine bays. Gradually, half the bays will have resorts where guests arrive on a shuttle from the airport and stay put. For now, Tangolunda has the golf course, the tourist office, and the Club Med, Sheraton, Club Maeva, and a new Holiday Inn Crowne Plaza under construction. (Adair, 1992, p. 190-191)

Many people from other parts of Mexico have come to the new tourist development, looking for work. The resident population has grown to about 30,000 mestizo construction workers, resort staff, and their families. There is now access by road and public transportation to areas which were previously accessible only by foot or boat.

Tourists are advised that "Tangolunda Bay beaches are nice and access to them is through the hotels; the beaches are public, so feel free to

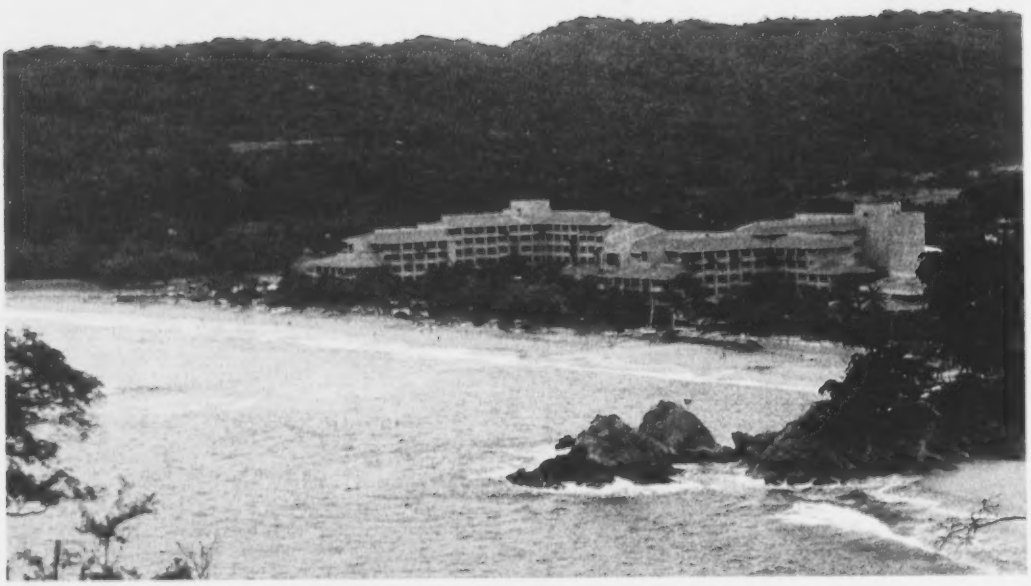

Figure 11. Tangolunda Bay, Bahias de Huatulco.

enjoy any spot that suits you" (Adair, 1992, p. 191), but the Mixtec dyers encounter a different reception. (See Fig. 12.)

Consumption of Purpura for Food

Working people of Huatulco are now eating snails, which causes a serious problem (H. Avendaño Luis, personal communications, August 11, 1993). The people who eat snails are "beach people" (H. Cruz Perez, personal communication, August 25, 1993), "those who work there" (H. Avendaño Luis, personal communication, August 15, 1993). Collecting food on the rocky shore does not require any capital.

Purpura is not considered a particularly desirable foodstuff; larger species are preferred. A fisherman in Puerto Escondido said that *Purpura* was not used for food because it has very little meat, but that other snails, *caracol china*, *caracol burro*, and *caracol calavera*, were (E. Jimenez Cruz, personal communication, August 7, 1993). When eaten, large *Purpura* individuals are preferred. *Purpura*, eaten raw or cooked, must be washed carefully to avoid the acrid taste and burning sensation of the dye, which was the snail's defense (H. Avendaño Luis, personal communication, August 11, 1993). They are sold for N$20/kilo for food (Javier, personal communication, August 19, 1993).

Not all snails collected are consumed directly. The snails are also used by "rock people" as bait (C. Cortero, personal communication, August 9, 1993), invested in the expectation of catching a larger animal.

The Institutional Management System

Dyers say that, in the past, the Coast Guard have sometimes checked dyers' credentials. A person without credentials would be asked to stop dyeing, or he might be arrested (H. Avendaño Luis, personal communication, August 14, 1993; H. Cruz Perez, personal communication, August 25, 1993). These measures were ineffective in deterring unauthorized people from dyeing. For example, Don Catalino had done considerable dyeing without credentials.

In Puerto Angel, I was unable to find any evidence of enforcement and the Coast Guard and Harbourmaster seemed unaware of regulations concerning *Purpura*. The Fisheries Office there, closest to the most significant dyeing areas, denied responsibility by saying that they were responsible only for the commercial use of marine food resources, and not for the collection of snails for dyeing or personal consumption. The office responsible for monitoring the use of *Purpura* for dyeing is in Salina Cruz, some 2-300 km from the dyeing areas (D. Victoria, personal communication, August 20, 1993).

Effects on *Purpura*

People affect the *Purpura* population directly by consuming individual *Purpura*. As well, human consumption of the other intertidal

Figure 12. Restricted access to dyeing area. Sign translates "Exclusive access, Royal Maeva [Hotel] guests".

snails, *Nerita* and *Littorina*, affects the *Purpura* population competitively because those snails are *Purpura*'s principal food sources (Garrity & Levings, 1981, 271-273).

There has been a marked decline in the abundance and size of *Purpura*. Before, there were "very many"; now, there are "very few" (C. Cortero, personal communication, August 9, 1993). The number of snails is low, and those snails that do exist are small, except in isolated, offshore areas (A. Guzman, personal communication, August 18, 1993). Doña Marisella says that there is much less shellfish-dyed material available (M. Franco Villafane, personal communication, August 23, 1993).

DISCUSSION

Changes in *Purpura* Population and Habitat Management

There are relatively few areas of safe harbour along the Pacific coast of Mexico. The harbours are in areas of rocky coast which provide habitat for *Purpura*. Dyeing used to take place near Acapulco (Nuttall, 1909, p. 370), but is unreported in more recent literature. At least hypothetically, dyeing on the rocky margins of a harbour is possible. I observed some *Purpura* in Puerto Escondido and near Puerto Angel, but nearly all were less than 30 mm in size. Mixtec *Purpura* dyeing tends to take place away from harbours, in relatively uninhabited areas of rocky coast. The traditional Mixtec dyeing area covers about 187 km of coastline, from Cerro Hermoso to Santa Cruz, of which approximately 52 km is rocky coastline, potential *Purpura* habitat. In these places, traditional dyeing methods ensured that the interaction had relatively little impact on the snail.

As described by Nuttall (1909), Gerhard (1962, 1964) and Turok et al. (1988), the traditional shellfish dyers of the Pacific Mexican coast provide an excellent example of 'common-property resource management' (Birkes, 1989a). As long as they were the only users of an almost-inaccessible resource, there was an effective tradition of stewardship, restraint, and co-operation at the local level. The same tradition continues among the Mixtec dyers of Pinotepa de Don Luis, but good self-management by the Mixtec has not been sufficient to ensure sustainable use of *Purpura*. "Common-property resource tragedies in the Hardin sense seem not to be the rule but the exception. The tragedy tends to be related to the breakdown of existing commons systems due to disruptions that have originated externally to the community" (Birkes, 1989b, p. 71).

Within the last two decades, human predation has become a significant threat to *Purpura* populations used by the Mixtec for dyeing. Under Purpura Imperial, *Purpura* dye began to be collected for the world market, exploitation became more intense, and more complex technology was employed.

Changes in habitat use have changed the use of the resource. The small, previously almost-uninhabited stretch of Pacific rocky beach, which used to be the preferred area for *Purpura* dyeing, was selected by the Mexican government for large-scale development for tourism. About 10 km of the rocky coast in the Bahias de Huatulco tourist development area has been developed, and the conversion of an additional 22.5 km of *Purpura* habitat is planned. The result will be that about half of the Oaxacan *Purpura* habitat will have been allocated to tourism. Almost all of the remaining habitat is located just west of Puerto Angel.

Greatly increased population and improved means of access to the habitat result in increased human predation on *Purpura*. To make

matters worse, Mixtec dyers are denied access to traditional dyeing sites which are now within the resort area.

Without effective state participation, the issue of self-management is irrelevant. What is significant is the effect of decisions made by all levels of the Mexican government about the habitat which sustains *Purpura*. The 1988 legislation indicates an aboriginal right to use the resource, but it fails to indicate an aboriginal right to control the resource. Without control over the habitat and consumption of *Purpura*, the right to dye is almost worthless.

Effects on *Purpura* Populations

The result of the non-traditional uses of *Purpura* is a reduction in population size and in the size of the individuals in the population. Except in isolated, offshore localities, few reach reproductive maturity. Although very little is known of *Purpura*'s reproductive cycle (A. Guzman, personal communication, August 18, 1993), their being killed before they can reproduce must bode poorly for future population levels.

Those relatively inaccessible localities where *Purpura* is able to reproduce are significant to the future of *Purpura* as a species. Possibly, repopulation of heavily predated areas may occur by means of spatfall from more protected populations. It is unlikely, however, to have any significant effect on availability for dyeing if foraging for *Purpura* continues.

Overview of the Mixtec Self-management System

An immediate result of reduction in *Purpura* populations is a reduction in the amount of yarn which can be dyed. The annual amount of yarn coloured by each dyer has gone from fifteen pounds (Gerhard, 1962: 184) to less than half of that. The number of individuals in each dyeing group is falling through attrition; the number of new members joining the group is smaller than the number old members leaving. If the group is too large, the amount of yarn each person can dye is too small to make the trip worthwhile. As well, some potential dyers have left Pinotepa de Don Luis, in order to work or study in more urban localities.

Dyers from Pinotepa de Don Luis have continued to use most of their traditional dyeing tools and techniques, in preference to those introduced by Purpura Imperial. Although it is easier to dislodge a snail with a metal rod than with a wooden one, wooden rods are seen as less likely to harm the snail's foot, protecting the snail's capacity to adhere to its rocky habitat. Because they do agricultural work during the spring and summer, and try to avoid maritime storms during the rainy season, people from Pinotepa de Don Luis observe the traditional Mixtec dyeing period, from October to March. The dyers know that this protects *Purpura* during their summer reproductive period.

Although it is not traditional, Mixtec dyers do sometimes use boats (H. Avendaño Luis, personal communication, August 15, 1993). This may be an innovation they learned from the *Mestizo* fishermen dyeing for Purpura Imperial. Thus, they can get to otherwise inaccessible rocky off-shore micro-environments where some snails are still left. Since the dyers of Pinotepa de Don Luis have neither boats, the skills to use them, nor the capital to acquire them, the system of persons involved in *Purpura* dyeing must then expand to include those who do. Quite probably, people like Don Catalino, coastal fishermen with ties to Pinotepa de Don Luis, will become a necessary part of the dyeing group.

The amount of *Purpura*-dyed yarn available to weavers has decreased, but the demand for it has increased. The Mixtec population is growing, even though government efforts have reduced the rate. Although various agencies have tried to discourage people from wearing traditional clothing, except as costume for special occasions, most Mixtec women of Pinotepa de Don Luis wear non-traditional attire only during their school years. As the population increases, so does the demand for yarn for *posahuancos*. A *posahuanco* containing *Purpura*-dyed yarn has become a symbol of considerable wealth; nearly all *posahuancos* are woven with industrially-dyed yarn.

Increasing participation in the world economy has resulted in a larger demand for *Purpura*-dyed yarn. As the availability of consumer goods increases, so does the desire for money with which to buy them. Weaving is a traditional way for women to participate in the economy, but one which has been limited until recently by the market for their textiles. That market has grown to include wealthy tourists and textile collections, as well as local peasants. The same amount of *Purpura*-dyed yarn that would be needed to make a single *posahuanco* could decorate a large number of smaller, Amusgo-style textiles. The tendency has been for weavers to make their traditional clothing from commercial yarn, so that they can use their traditionally-dyed yarn to make textiles for a foreign market.

Community-based resource development based on systems of traditional knowledge may be effective in managing even limited natural resources (cf., e.g., Feit, 1988; Plath & Hill, 1987). Such development may:

> (i) Provide total protection to some habitat patches, representing different ecosystems, so that resource populations are always maintained above some threshold level;
>
> (ii) Provide total protection to some selected species so that community level interactions are minimally disrupted;
>
> (iii) Protect such life history stages as appear critical to the maintenance of the resource population;
>
> (iv) Provide total protection to resource populations at certain times; and

> (v) Organize resource use in such a way that only a relatively small group of people controls access to a particular resource. (Gadgil & Berkes, 1991, p. 136)

The Mixtec dyers' self-management practices exhibit features consistent with all but the fourth of these five management objectives.

CONCLUSIONS

Traditional Mixtec resource use more closely resembled the 'common property resource' model of sustainable natural resource management than the 'tragedy of the Commons' now taking place. The resource management of *Purpura*-dyeing of Pinotepa de Don Luis is far more complex than the somewhat pristine one described by Gerhard (1962; 1964). Gerhard described a system of self-management of a resource by people whose traditional knowledge supported sustainable use of that resource. The government took no part in resource management. Gerhard indicated that the dyers, of their own accord, co-operated to secure sustainable resource use for the group as a whole, rather than engaging in depletive competition, and there was no competition for other use of *Purpura* or its habitat. Until recently, this was a remote part of the world, and few outsiders had the knowledge, desire or determination to visit Pinotepa de Don Luis or the dyeing areas used by people from there. It was up to the dyers themselves to determine how to manage *Purpura* use.

El Caracol Purpura: Una tradicion milenaria en Oaxaca (Turok et al, 1988) sounded an alarm, demonstrating that Purpura Imperial, using non-traditional methods more concerned with short-term productivity than with sustainability, had seriously threatened the resource. In the resulting 1988 legislation (see Appendix A), the Mexican government expressed the intent to conserve *Purpura* for the use of indigenous people, for indigenous purposes, and by indigenous means.

My intent in visiting Pinotepa de Don Luis and area was to investigate the *Purpura*-management system, five years later. I had hoped that I might find a case of successful co-management, in which the users' knowledge, derived from ongoing attentive use of the resource and traditional knowledge derived from earlier generations having engaged in the same activity, might work together with the scientific expertise and power of the state, in order to secure the ongoing use of *Purpura*. Such was not the case. Rather than finding a state-mediated resolution of the aforementioned problems, I found that state participation was scarcely more than nominal, and that new problems of habitat management (especially human consumption of *Purpura*) had arisen, problems far beyond the capacity of the most effective self-management system.

The prognosis for sustainable use of *Purpura* is not good. Pressure on the resource and its habitat will likely increase. Because of the adaptive flexibility of Mixtec culture, as long as *Purpura* continues, I expect that the dyers of Pinotepa de Don Luis will seek *Purpura* in protected areas, and that textiles dyed with it will continue to be woven.

For a nation to protect its natural resources against abuse by foreign interests, or by those within, requires it to take on stewardship of those resources. To do so requires understanding of the "interconnectedness of

life" (Knudtson & Suzuki, 1993, xxix) and practice based on an understanding of the interconnected implications of action. Economic development projects, for example, will certainly affect the environment and culture of the area. Coordinated planning in acknowledgment of that fact would go far in predicting, if not necessarily forestalling untoward effects and consequences.

RECOMMENDATIONS FOR FURTHER RESEARCH

It is probable that the most significant predation on *Purpura* is going to continue to be human foraging for *Purpura*. More information about the use of *Purpura* as a food source would improve our understanding of this significant variable within the system.

To date, most investigation of *Purpura* dyeing has focussed on the dyers of Pinotepa de Don Luis. Useful original and comparative information may derive from study in other Mexican localities and in Costa Rica.

There appears to be a significant world market for *Purpura*-dyed textiles. Investigation of current and potential marketing strategies could facilitate optimal use of the resource.

Subtle variations in the use of colour and woven embellishments in the design of *posahuancos* signify regional, functional, and idiosyncratic differences. More systematic and conclusive documentation of the range of *posahuanco* design and materials would be intrinsically interesting, as well as helpful for interpreting museum specimens.

Much remains to be known of the behaviour of shellfish dyes. Quantitatively-oriented materials research, including factors such as yarn, soap and dye chemistry, could help us to understand ancient dyeing technologies.

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APPENDICES

A. Intersecretarial Accord between the Secretaries for Urban and Ecological Development, Public Education, and Fisheries

ARTICLE ONE: For the common interest, this regulation is hereby enacted for the conservation, development and utilization of the snail *Purpura pansa* on the coasts of Southern Baja California, Sonora, Sinaloa, Nayarit, Jalisco, Colima, Guerrero, Oaxaca and Chiapas.

ARTICLE TWO: The collection, retention and transportation of the specimens out of their area of natural distribution as well as killing of the mollusk for the extraction of dyes is prohibited. Similarly, commercialization of the organism in whole or in part is prohibited.

ARTICLE THREE: The dye can be utilized only by the indigenous communities living along the coast and those who have historically and traditionally made use of it, according to their distinct and special practices, customs and values;

Such utilization shall require specific permits from the Secretariat of Fishing, which shall be issued through the system of permit accreditation. Permit holders shall submit a monthly report on their work, stating the area of work, number of working days, and quantity of skeins dyed: the latter expressed in kilograms.

ARTICLE FOUR: The extraction and utilization of the dye shall be subject to the following procedures:

a) Dye extraction for the dyeing of natural fibres intended, exclusively, for the manufacture of traditional indigenous dresses or garments, shall be done at the precise location of the resource without sacrificing the snail.

b) A stick or wooden spatula should be used to detach the snails from their site of attachment.

c) During the dyeing process, the use of pressure or squeezing of the 'shell' shall be avoided and the dye shall be poured directly onto the products to be dyed.

d) The extraction process should take place in humid areas that are protected from the sun.

e) Once the dye excreted by the mollusk is obtained, it should be returned to the site from which it was taken and immediately sprinkled with water.

f) The exploitation of the snail for the extraction of the dye should conform to the technique of 'snail bank' rotation.

ARTICLE FIVE: A period of at least twenty days is required between each period of utilization of the snail banks. The minimum size of commercial exploitation of this type is 30 millimetres.

ARTICLE SIX: Permit holders are obliged to undertake the preparation programs of organised by the fishing authority in charge of these marine species. Likewise, they shall participate in conservation programs determined by the Secretariat of Fishing and that of Urban and Ecological Development.

ARTICLE SEVEN: Based on studies undertaken by the National Institute for Fishing, the Secretariat of Fishing, in coordination with that of Urban and Ecological Development, shall determine the seasons in which the snails can be utilized for dye extraction in the states of Southern Baja California, Sonora, Sinaloa, Nayarit, Jalisco, Colima, Michoacán, Guerrero, Oaxaca and Chiapas.

ARTICLE EIGHT: The Secretariats of Fishing and that of Urban and Ecological Development, in coordination with the Secretariat of Public Education, shall develop education and preparation programs to promote the development of the species, taking into consideration knowledge already possessed by the groups that have traditionally exploited it.

ARTICLE NINE: The Secretariats of Urban and Ecological Development, Public Education and Fishing shall, within their competence, undertake studies and research for the elaboration of projects, the identification of techniques and the introduction of methods and systems for the purpose of the conservation and better utilization of the snail *Purpura pansa,* and the works of art for which the dye is used.

ARTICLE TEN: Governments of the Federal Entities can participate in the studies, research and projects that shall be established, as well as in the execution of the respective programs, by accepting the corresponding agreements of coordination, and

ARTICLE ELEVEN: The Secretariats of Fishing, Urban and Ecological Development and Public Education shall make the necessary efforts to undertake preventive campaigns against the illegal trafficking and irrational exploitation of the snail; and provide information on the applicable sanctions and natural and cultural consequences of these illicit practices.

TRANSITORY

This agreement goes into effect the day after tts publication in *The Official Daily of the Federation.*

Mexico, D. F., March 13, 1988.- Secretary for Urban and Ecological Development, Manuel Camacho Solás.- Signature.- Secretary for Public Education, Miguel González Avelar.-Signature.- Secretary for Fishing, Pedro Ojeda Paullada.-Signature. (trans. from Turok et al., 1988, pp. 154-156).

B. Interview Guide

1. **Initiation**

How did the respondent begin dyeing?

Who taught him? (What social relationship: kinship, marriage, god parenthood, etc. exists between them?)

When did this take place? (Context in the life cycle)

Why did he begin? (Financial pressure, *rite du passage*, ...)

May anyone participate? (Is membership annual, seasonal ...?)

2. **The Practice**

Was it difficult to learn?

What did he need to learn?

Step-by-step account of procedure:

With whom? (Social relationship)

Materials used, treatment of them (before and after) and reason for doing so.

Organization of activity:

- decision making: unanimity, consensus, majority
- who decides who may participate?
- interaction with other groups?
- timing, transportation and itinerary
- for whom is dyeing done?
- Social relationship?
- Economic relationship?

Is it difficult to find enough snails?

Does everybody do it the same way (non-indigenous and innovative techniques)

3. The Individual

Demographic information: name, age, places of origin and residence, ethnicity, marital status

Occupation: participation in agriculture, local/migrant wage labour

Social relationships with other dyers

Participation in the civil-religious hierarchical system

4. Resource Management

Is there a local body (e.g. community board, council of elders) which controls the process?

Does anyone ever make inappropriate use of the resource? (e.g. taking too much, using it disrespectfully)

What rules and understandings are there? How might disputes be settled?

How does the state licensing system work?

Do any of the people from Pinotepa have a license to dye?

What is involved in getting a license?

Who issues them? Where? How much does it cost? How long do they last?

How is 'indigenous' status determined?

Are there any people with licenses who do not deserve them?

Does anyone ever check whether dyers have licenses?

What are the consequences of being caught without one?

Does anyone keep statistics on the amount of dyeing that takes place? Who? Where? What sort of information?

What has been the impact of the 1988 protective legislation? Has it made any difference? Is illicit dyeing still taking place?

Does he think that the dyeing process is likely to continue?

C. Diploma Awarded to the Artisans' Association

El Presidente Constitucional de los Estados Unidos Mexicanos
acuerdo con la Ley de Premios Estimulos y Recomensas Civiles
otorga el
Premio Nacional de Ciencias y Artes
en
Artes y Tradiciones Populares
al
Grupo de Tenidores del Caracol Purpura Pansa
de la Communidad de Pinotepa de Don Luis, Oaxaca
como pueblo reconocimento que tiene amplios campos de aplicacion, lo cual ha contribuido a conservar parte de las mejores tradicions culturales del pais

Para constancia se extiende el presente
DIPLOMA
Mexico, D. F. a 16
diciembre de 1985
El Presidente Constitucional de los Estados Unidos Mexicanos
[signature]
Miguel de la Madrid H.

Translation:

The Constitutional President of the United Mexican States
in accordance with the Law of Incentive Awards and Civic Honours
award the
National Prize of Sciences and Arts
in
Arts and Popular Traditions
to the
Dyers' Group of the Snail *Purpura Pansa*
of the Community of Pinotepa de Don Luis, Oaxaca
as a town recognized as having a wide range of skills,
which has contributed to preserve some of the major
cultural traditions of the country.

In acknowledgment is given this
DIPLOMA
Mexico City, the 16
December of 1985
The Constitutional President of the United Mexican States
[signature]
Miguel De la Madrid H.

D. Population Statistics, Pinotepa de Don Luis, July, 1993

Age:	Male:	Female:
70+	76	37
65-69	73	27
60-64	82	56
55-59	104	56
50-54	64	95
45-49	110	157
40-44	229	200
35-39	182	291
30-34	262	206
25-29	377	309
20-24	255	426
15-19	515	456
10-14	503	721
5-9	603	702
1-4	514	558
-1	124	137
Total:	4434	4133

Source: *Instituto Mexicano del Seguro Social, Centro de Salud*, Pinotepa de Don Luis.

E. Formal Interviews Cited

AVENDAÑO LUIS, Habacuc. (President of the dyers' Group), Pinotepa de Don Luis, August 8, 11, 14, 15 & 21, 1993.

AVENDAÑO LUIS, Teresa. (Weaver; Don Habacuc's sister), Pinotepa de Don Luis, August 11, 13, 14 & 16, 1993.

CORTERO Catalino. (Fisherman; prospective member, dyers' Group), Pinotepa de Don Luis, August 9, 1993.

CRUZ DE LEYVA, Isabel. (My landlady; Don Israel's widowed niece), Pinotepa de Don Luis, August 10, 11 & 15, 1993.

CRUZ PEREZ, Herminio. (Dyer; son of the late President of the dyers' Group), Pinotepa de Don Luis, August 25, 1993.

FLORES GARCIA, Artemia. (Indigo dyer; Doña Isabel's co-godmother), Pinotepa de Don Luis, August 24, 1993.

FRANCO VILLAFANE, Lucilia. (Retired textile dealer; Doña Marisella's sister), Pinotepa de Don Luis, August 23, 1993.

FRANCO VILLAFANE, Marisella. (Textile dealer; Maria Isabel's godmother), Pinotepa de Don Luis, August 23, 1993.

GUZMAN, Antonio. (Biology professor, Universidad del Mar), Puerto Angel, August 18, 1993.

HERNANDEZ SUMANO, Manuel. (Businessman, dry goods; Don Israel's co-godfather), Pinotepa de Don Luis, August 1 & 21, 1993.

JAVIER [surname unknown]. (Young fisherman), Playa Las Minas, near Puerto Angel, August 19, 1993.

JIMENEZ CRUZ, Esteban. (Fisherman), Puerto Escondido, August 7, 1993.

LEYVA CARMONA, Rudy. (Credit Union manager, Don Israel's son), Oaxaca City, August 6, 1993.

LEYVA CRUZ, Maria Isabel. (Schoolteacher; Doña Isabel's daughter), Pinotepa de Don Luis, August 9 & 10, 1993.

LEYVA CRUZ, Sigfrido. (Doña Isabel's son). Pinotepa de Don Luis, August 10, 1993.

MARIN DE MEJILLA, Amalia. (Weaver; Don Catalino's mother-in-law), Pinotepa de Don Luis, August 9, 1993.

PARMENTER, Ross. (Historian). Oaxaca City, August, 1992.

MEJILLA MARIN, Soledad. (Weaver; Doña Amalia's daughter), Pinotepa de Don Luis, Aug. 22, 1993.

VICTORIA, Damian. (Manager, Fisheries office). Puerto Angel, August 20, 1993.